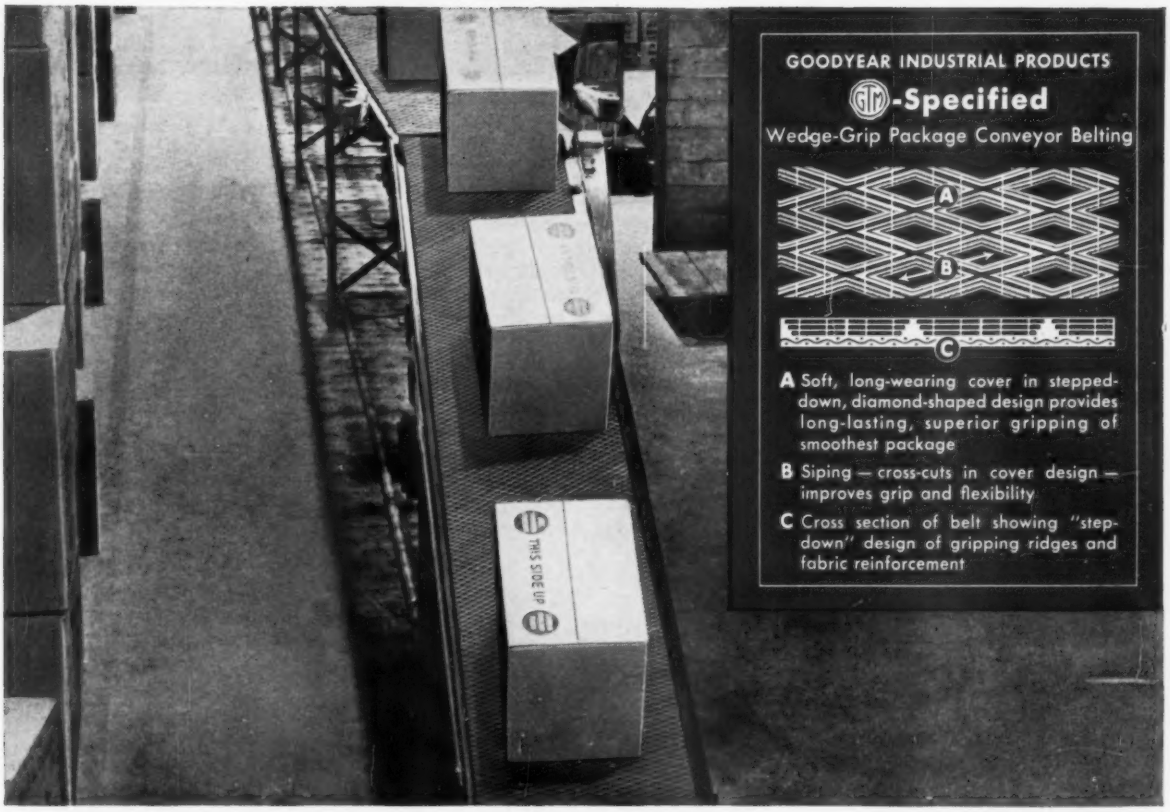
THIS SIDE UP
GOODYEAR INDUSTRIAL PRODUCTS
GM-Specified
Wedge-Grip Package Conveyor Belting
A
B
C
A Soft, long-wearing cover in stepped-down, diamond-shaped design provides long-lasting, superior gripping of smoothest package
B Siping — cross-cuts in cover design — improves grip and flexibility
C Cross section of belt showing "step-down" design of gripping ridges and fabric reinforcement

New way to save money without a slip

There's never been anything like this new Wedge-Grip Package Conveyor Belting! It can move almost anything—boxes, bags, cases, cans or what have you. And it can carry them up the startlingly steep inclines without delay-causing slippage.

Credit belongs to the new Wedge-Grip cover design – of unmatched gripping power. Special gripping ridges—in a unique diamond-shaped pattern—hold even the smoothest packages firmly. Their unusual "step-down" design means that whenever a ridge wears off, there's another there to do its job. And this belt sheds clogging dirt and debris as it moves.

What's more, that's only the surface design. A special rubber cover compound was also developed – just for this belting. It's soft for even greater gripping power—yet highly abrasion-resistant. It defies the normal hardening effects of age. It does not mildew. And it won't mark the packages it handles.

But get the whole moneysaving Wedge-Grip story from your G.T.M.—Goodyear Technical Man. He'll be glad to tell you about the complete line of Goodyear package conveyor belts. Just contact him through your Goodyear Distributor—or write Goodyear, Industrial Products Div., Akron 16, Ohio.

WEDGE-GRIP CONVEYOR BELTING by

GOODYEAR

THE GREATEST NAME IN RUBBER

Wedge Grip—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

For more facts circle 502 on Reply Card

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Editorial Director

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'ROUND ABOUT

with the editors in field and office

Edited by R. L. Marinello

Plant Layout Work Course

AIMED SPECIFICALLY at helping industry consolidate expansion, plan the layout of new buildings or rearrange existing plants, is a one-week work course to be held at the University of Kansas, Kansas City, Kansas, from September 2 to the 6.

Some of the topics which will be discussed at the work course are: Establishing facilities requirements; Analysis of material flow; Evaluating alternative layouts; Checking and selling the plan; and Management and layout planning.

Additional information about this course may be obtained by writing to Midwest Work Course on Plant Layout and Facilities Planning, 4112 Eaton Street, Kansas City 3, Kansas.

On Testing Thermocouples

METHODS OF testing thermocouples and thermocouple materials and certain precautions that must be observed if reliable results are to be obtained are described in a booklet just published.

The booklet mainly considers calibration of platinum versus platinum-rhodium, copper-constantan, Chromel-Alumel, and iron-constantan thermocouples, and some guidance is provided in the selection of a test method best adapted to a given set of conditions.

One section discusses calibration at freezing points, melting points and boiling points, while another chapter covers calibration by comparison methods.

The booklet is identified as National Bureau of Standards Circular 590. The price of this 21-page booklet is 20 cents and may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Intensive Engineering Courses

EIGHT COMPLETE basic industrial engineering intensive courses will be offered concurrently at Washington University, St. Louis, Missouri, from September 8 through September 19.

The following courses will be presented: Quality Control, Motion and Time Study, Plant Layout and Materials Handling, Tool Engineering, Elements of Integrated Data Processing, Engineering Economy, Production Control, Collective Bargaining for Engineers, Engineering Psychology, and Materials and Process of Manufacturing.

Courses are intended for personnel desiring a basic introduction to the

Editor Attends Lighting Conference in Nela Park

This group, which includes Scoop Skubik (arrow), recently attended a conference held at the General Electric Lighting Institute in East Cleveland, Ohio. Various subjects of interest to industrial executives and engineers were covered

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4 NEW TIME SAVING TOOLS from Graybar

FOR ELECTRICAL CONSTRUCTION AND MAINTENANCE

***NEW*—Super Portable**

WELLS 49A
METAL CUTTING BAND SAW

Rigged with handle and ball bearing wheels, this new Wells 49A metal cutting band saw does double duty in the shop and on the job. As a horizontal cut-off tool it has a capacity of 3½" x 6". Swing the head and it becomes a vertical band saw. Call Graybar for details.

***NEW* Light weight, speedy**

CONDUMATIC BENDER

This new Condumatic motor driven conduit bender is powerful enough to handle rigid heavy wall conduit in sizes of ½", ¾" and 1". It's light enough to make it easy to move from job to job, or deck to deck. Makes 90° bends, offsets and doglegs right up close to the elbow. Ask Graybar for literature.

***NEW*—Back saving**

ALLEN ELEVATING SCAFFOLD

Make a crew out of one electrician with the new Allen Elevating Scaffold. Working platform regulates in heights of 4" and jacking device raises and holds heavy fixtures in place until securely fastened. Makes fixture hanging a fast, precise mechanical operation. Also, excellent for use in installing electrical duct or conduit systems. Have Graybar rush facts to you.

***NEW*—Shoot lines through conduit with**

JET LINE GUN—With the new Jet Line Gun you can shoot a line through conduit runs up to 250 feet, in seconds. Just load the Jet Line Gun with a CO_2 cartridge, line attached. Fire gun into conduit. Cartridge become projectile. Cartridge and line pop out open end of conduit. Pull heavier line in, then pull in wire. Call Graybar for demonstration.

Write for literature on all these new 1958 helps for electrical construction. They're typical of new electrical equipment you can expect from Graybar. If it's new, if it's extra good, if it's built by one of the country's leaders, Graybar has it for you. For immediate action—

85

CALL **GraybaR** FIRST FOR . . .

*GraybaR Everything Electrical *GraybaR ELECTRIC COMPANY
QUALITY SINCE 1869 * REG. U.S. PAT. OFF.

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GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK

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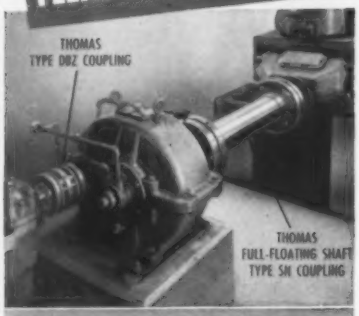
PROTECT Your Machinery with
THOMAS
ALL METAL
FLEXIBLE COUPLINGS



NO LUBRICATION
NO MAINTENANCE
NO WEARING PARTS

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.
They will protect your equipment and extend the life of your machines.
Properly installed and operated within rated conditions, Thomas Flexible Couplings should last a lifetime.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES.

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

For more facts circle 504 on Reply Card

'ROUND ABOUT

subject. Objectives of the courses will be to help prepare the attendee to (1) apply the course concepts in his own organization, and (2) help train others in his company in the principles of the course.

For further information, write to University College, Washington University, St. Louis 5, Missouri.

New Appointment at Goodrich

Orville W. Taylor has been appointed senior engineer of the Henry, Illinois, General Chemicals Plant of B. F. Goodrich Chemical Company. Taylor will report to the plant engineer.

He moves to his new assignment from the company's Calvert City, Kentucky, plant. He joined the company in December, 1950, as a general foreman of utilities at the Institute, W. Va., synthetic rubber plant then operated by B. F. Goodrich Chemical. In May, 1954, he was transferred to the Calvert City plant as utilities engineer.

Home Study Course on Metal Coating Processes

ELECTROPLATING and Metal Finishing is the name of a new course for home study or in-plant training programs recently added to the curriculum of the Metals Engineering Institute, a division of the American Society of Metals.

The course consists of 15 lessons—half of which discuss such topics as electricity, electrical equipment, polarization, and current and resistance. In addition, there are lessons on preparation of metals for plating and the structure and properties of electrodeposits. Specific discussions tell how to handle copper, silver, gold, zinc, cadmium and other rare metals. Electroforming, electrowinning and electrorefining complete the course.

For further information, direct your inquiry to the Metals Engineering Institute, 7301 Euclid Ave., Cleveland 3, Ohio.

Instrument Conference

CONCURRENT CLINICS, workshops and technical sessions will be featured at the 13th Annual Instrument-Automation Conference and Exhibit. Conference and exhibit are scheduled for September 15 through the 19 at Convention Hall, in Philadelphia.

Plans for the various clinics and sessions include: Computer Clinic, Maintenance Clinic, Data Handling Workshop, Maintenance Management Workshop, Sales Engineers Workshop and technical sessions conducted by leading authorities.

Further details may be obtained by writing to Fred J. Tabery, 3443 South Hill St., Los Angeles 7, California.

Air Conditioning Clinic

INFORMATION ON THE practical aspects of air conditioning and refrigeration is provided by the Air Conditioning Clinic developed by The Trane Company.

The clinic is designed to help train contractors, plant engineers and service personnel in the proper selection, installation, maintenance and servicing of air conditioning and refrigeration equipment for improved system performance.

Each of the 10 sessions in the clinic can be delivered as a slide-talk in approximately two hours. The sessions are arranged so that the first six form a basic theory course while the last four form a more advanced application and service course.

Subjects covered include refrigeration information on cycling, piping, controls, compressors and accessories, cooling load estimating, use of psychrometric chart, equipment selection, installation and start-up of self-contained air conditioners, trouble diagnosis and compressor disassembly and reassembly.

Further information about these clinics may be obtained by contacting one of the Trane representatives at the Trane sales office nearest you.

Plant Engineer Promoted

Joseph A. Harinek has been appointed chief engineer of Associated Spring Corporation's Gibson Division in Chicago, to succeed Leonard M. Kulze who has been promoted to factory manager.

Mr. Harinek began work for the Gibson Division in November, 1935, as a technician in the laboratory. In March, 1936, he was promoted to combustion engineer and later to assistant plant engineer. In August, 1945, he was made chief research engineer; in August, 1949, purchasing agent; and in May, 1953, plant engineer.

In his new position as chief engineer he will be in charge of planning, estimating and product engineering.

*Snap-tite

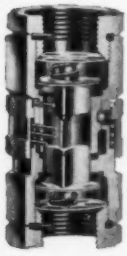
QUICK-CONNECT
QUICK-DISCONNECT COUPLINGS

in larger sizes

immediate delivery
FROM FACTORY STOCKS

SNAP-TITE'S "H" COUPLING, SIZE FOR SIZE, IS THE SMALLEST COUPLING WITH HIGHEST STRENGTH AND HIGHER EFFICIENCY

Snap-Tite's "H" Couplings are now factory-stocked for quick shipment to you, not only in the smaller sizes (below 1" ID) but in all sizes up to and including 3"—in steel, brass, aluminum, and 303 and 316 **Stainless Steel.** And "H" Couplings can be made to your order, up to 10" ID.



Available with valves to give two-way or one-way automatic line shut-off, or without valves for straight-thru flow, "H" Couplings are built to handle high pressures in hydraulic and air systems.

Recessed valve washers . . . fluted valve stems . . . valve stops with minimum flow restrictions . . . large inside diameter—allow maximum flow capacity with lowest pressure drop.

See the Snap-Tite representative in your city or write for Bulletin 240.

*Snap-tite, INC.

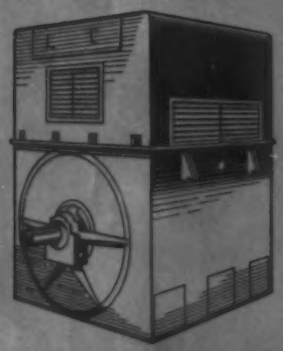
UNION CITY 5, PENNSYLVANIA

SNAP-TITE COUPLINGS CAN HANDLE ALMOST ANYTHING THAT FLOWS

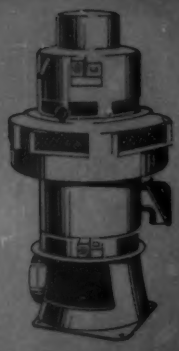
OPERATION upturn

Buy now for extra values

GENERAL ELECTRIC

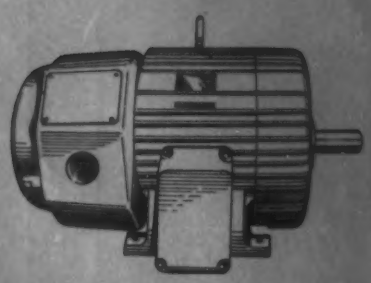


NEW WEATHER PROTECTED MOTOR—250 to 5000 hp—features high-up air intake and discharge. Fully tested. Install it, don't worry in bad weather. GEA-6571.

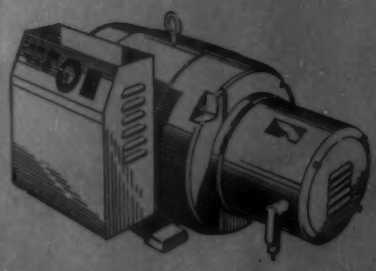


NEW VERTICAL WEATHER PROTECTED MOTOR—150 to 1000 hp—has withstood hurricane-force winds and water blasts. Windings remained completely dry.

DESIGN BY COMPUTER of 150- to 5000-hp motors—provides more complete motor design analysis, helps speed quotations, and gives faster scheduling and shipment.



NEW WOUND ROTOR MOTORS—5 to 150 hp—average 50% lower inertia, up to 59% size reduction. Significant dollar savings can be achieved. GEA-6713.



NEW SYNCHRONOUS GENERATOR—40 to 150 kw—eliminates brushes, slip rings and commutators. GEA-6795. 175 to 300-kw ratings have static exciter. GEA-6809.

NEW TEFC TEXTILE MOTORS—7½ to 25 hp—feature exclusive new endshield and fan designs for optimum performance in lint-laden textile atmospheres. GEA-6795.

For Extra Values NOW...
Buy General Electric Motors

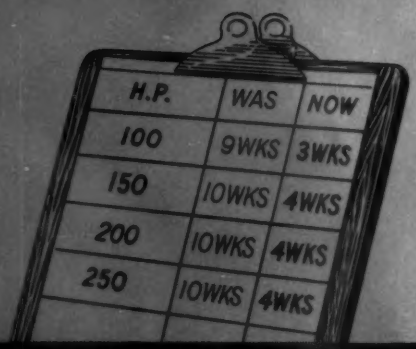
"Operation Upturn" is General Electric's program to acquaint you with new products and services of such significance that you can justifiably "Buy Now for Extra Values."

During the past year, literally hundreds of "Extra Values" have been added to G-E motors. And, even with significant increases in manufacturing costs, motor and generator prices have been advanced only slightly. Here are just a few typical Extra Values for you to consider. For more details, write for listed bulletins or call your nearby G-E Apparatus Sales Office or Distributor. General Electric Co., Schenectady, N.Y.

802-1

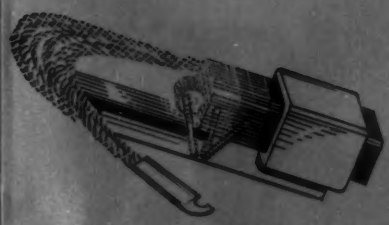
GENERAL ELECTRIC

OVER 40 QUALITY CHECKS keynote the rigorous quality control programs operating today to help assure top performance from entire General Electric line.

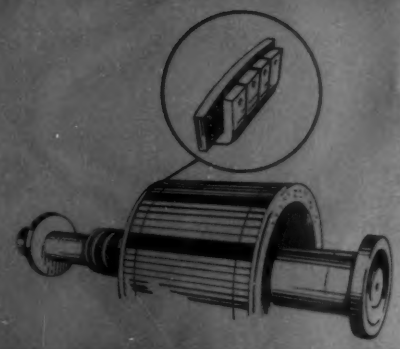


50% CUT IN SHIPMENT TIME for 100 to 350-hp motors has been achieved with new parts inventory system. Shipping time is now reduced to 4 and 3 weeks.

NEW ACOUSTIC TREATMENT for large high speed motors reduces high-frequency "whine" to a quiet hum, improving employee comfort, efficiency. GEA-6571.



NEW "CONSTANT PRESSURE" carbon brush holder eliminates adjustment, offers up to 50% longer wearing length, reduces large motor maintenance. GEZ-1158.



FLEXIBLY-CONNECTED WINDINGS improve starting performance, permit wider application of large G-E synchronous motors to high-inertia drives. GEA-6620.

IMPROVED BONDED FIELD POLES for low-speed synchronous motors. Bonding technique continually advanced in large motor construction since 1938 inception.

Know-how makes the

IN INSTALLATION AND SERVICE ENGINEERING

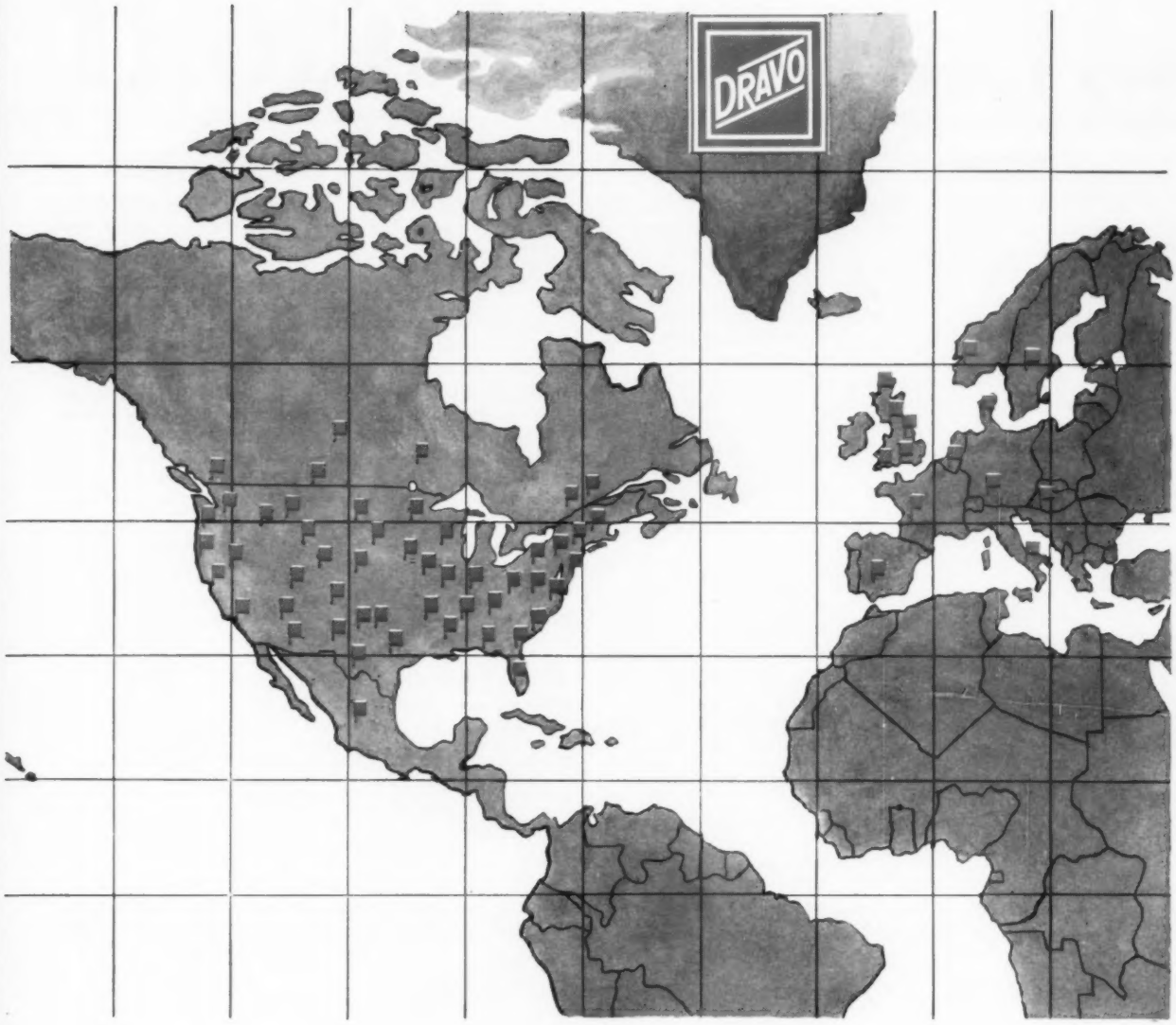
Dravo's new *Counterflo* is the only industrial space heater backed by a world-wide organization. The map gives you an idea of the number and location of the qualified heating engineers, sales and service offices, representatives and foreign licensees who form this global network.

This means that a *Counterflo* owner not only has outstanding heater performance, but also a highly trained, factory-schooled service organization on 24-hour call. Should the need arise, service, for both installation and maintenance, is as close as your telephone. Dravo's wide-spread field activity is supplemented by the Pittsburgh staff, who stand ready to fly to any part of the country immediately.

This is just one of the many outstanding benefits available with your new *Counterflo*. For more information, write for Bulletin 564. Address DRAVO CORPORATION, DRAVO BUILDING, PITTSBURGH 22, PA.

DRAVO

CORPORATION



difference

5 REASONS WHY THE DRAVO COUNTERFLO IS YOUR BEST SPACE HEATER BUY

NEW PYROJET BURNER—exclusively Dravo—first burner developed specifically for direct-fired space heaters. Burns low cost oils efficiently. Switches from gas to light oil automatically.

NEW INDUCED DRAFT FIRING—automatically controls fuel/combustion air ratio, high negative pressure in combustion chamber adds extra safety; extra efficiency because of complete control of combustion air.

NEW AIRFOIL COMBUSTION CHAMBER—stainless steel, ribbed for extra strength and channeling of airflow—guaranteed for 10 years. Longest possible flame travel for complete combustion within primary heat transfer area.

NEW LOW-SPEED FANS—forwardly curved, low-speed, double inlet fans with high efficiency reduce horsepower requirements in the new Counterflo drastically, operating costs are lower.

NEW DISCHARGE PLENUM—distributes heated air at high velocity without annoying drafts. Adds new flexibility to warm air distribution patterns.

For more facts circle 507 on Reply Card

Buy 'em or Build 'em... WRIGHT

MOTOR-DRIVEN CRANES • 1-Ton to 25-Ton Capacities, Up to 55-ft. Spans

• Now, you can buy modern, efficient WRIGHT Motor-Driven Cranes two ways—factory-assembled as a complete unit or built locally from WRIGHT "matched" components. Shown below is a B-1514 top running double bridge crane and a B-516 underhung single bridge crane—just two of the many models of WRIGHT Motor-Driven Cranes. All can be built locally from end trucks, trolley hoists and crane drive units. All will save you money by drastically reducing freight charges. Instead of paying shipping costs on a complete unit, you pay only for the component parts and order heavy I-beam structurals locally. In addition, WRIGHT will furnish you with a detailed assembly diagram and a complete list of the structural components you'll need.

FEATURES OF WRIGHT MOTOR-DRIVEN CRANES

End Trucks of welded steel channel construction with heavy steel plate diaphragms. Squaring shaft of ground and polished steel—geared to both end trucks to assure uniform travel of the crane.

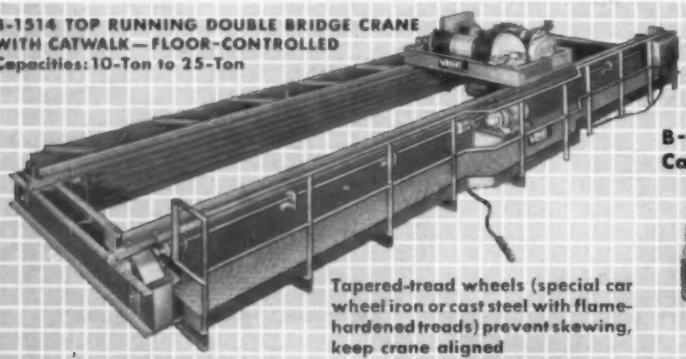
Timken Tapered Roller Bearings (two to each truck wheel). Placed in opposition to one another, these bearings compensate for both radial and thrust loads and will safely absorb shock treatment. Adjusting nut on wheel axle takes up bearing play with ease.

Ring Gear • Heat-treated steel. Teeth are 20° stub, involute form.

Full Integrated Electrical Controls for WRIGHT Cranes equipped with a WRIGHT Hoist and a WRIGHT Crane Drive Unit will be factory-installed at no extra cost if you assemble your own crane locally.

Controls • Single speed pushbutton control furnished with cranes equipped with fluid drive—two speed and variable speed pushbutton control on cranes without fluid drive. 6-button pendant—2 buttons each for crane travel, trolley motor and hoist motor.

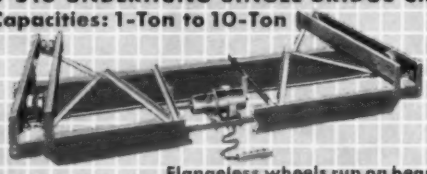
B-1514 TOP RUNNING DOUBLE BRIDGE CRANE WITH CATWALK—FLOOR-CONTROLLED
Capacities: 10-Ton to 25-Ton



Tapered-tread wheels (special car wheel iron or cast steel with flame-hardened treads) prevent skewing, keep crane aligned

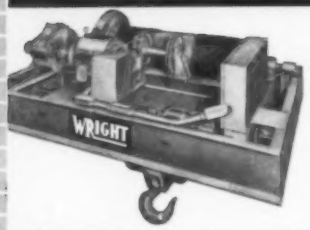
B-669 Top Running Double Bridge Crane and B-514 Top Running Single Bridge Crane can be furnished with cab control or floor control in a wide variety of speeds, lifts and types of control. These units are not shown

B-516 UNDERHUNG SINGLE BRIDGE CRANE
Capacities: 1-Ton to 10-Ton



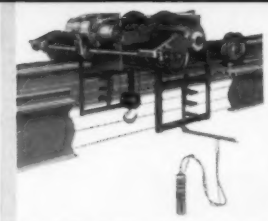
Flangeless wheels run on beams with varying flange widths. Guide rollers keep crane properly aligned

ASSEMBLE YOUR OWN CRANE WITH STRUCTURALS AND COMPONENTS BOUGHT LOCALLY!



TROLLEY HOIST FOR B-1514 CRANES

Standard B-1514 cranes are equipped with a top running, double beam trolley hoist. This unit is either motor-driven or hand-geared.



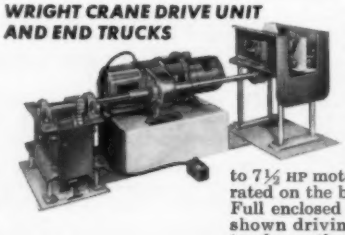
TWH 2-MOTOR TROLLEY HOIST FOR B-669 CRANES

This unit is either motor-driven or hand-geared, and includes a WRIGHT *Speedway* Electric hoist. The trolley is designed so that short or long drum hoists can be used with standard 5'-0" center bridge beams. Welded steel frame is carried on double flanged, chilled tread, car wheel iron wheels equipped with two Timken Tapered Roller Bearings. Upper, lower limit switch. 4, 6 or 8-button pendant.

WRIGHT TWO-MOTOR ELECTRIC HOIST

Recommended for use with the WRIGHT B-516 crane shown above, or the B-514 crane, not shown. Available in a capacity range of 4-ton to 10-ton. Unusually compact for close headroom. Features NEMA 30-minute motors exclusively, two-speed or variable speed controls. Heat-treated alloy steel gears, pinions. Ductile gear cores are shock-resistant. Anti-friction bearings. Weston load brake. Ingenious motor brake is cam-controlled...foolproof adjustment.

WRIGHT CRANE DRIVE UNIT AND END TRUCKS



This compact, adaptable drive unit, totally enclosed for outdoor service, consists of an electric motor and well proportioned gear reduction. Single speed motors drive through fluid coupling, which is optional with two speed or variable speed motors. Two frame sizes accommodate 2 to 7½ HP motors. All motors up to 5 HP are rated on the basis of 30-minute duty cycle. Full enclosed sealed ball bearings. Unit is shown driving standard underhung end truck on the right and top running end truck on the left.

Wright Hoist Division
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

ACCO

MOTOR-DRIVEN and HAND-OPERATED CRANES

HAND-OPERATED CRANES • To Fill a Wide Range of Applications up to 50 Tons

•WRIGHT's line of hand-operated cranes is also available to you for money-saving local assembly with WRIGHT End Trucks and Hoists, or as a complete unit from the factory. Whether you buy 'em or build 'em yourself, you'll find these cranes are made to machine tool accuracy, assuring you of a crane that's exact in span, true in alignment, and perfectly square throughout. Though only two models are shown below (B-9 and B-36), double bridge B-47 cranes are also available. Any of these cranes will give you an excellent stand-by installation which will permit accurate spotting of loads. They are offered in capacities of 1-ton to 50-tons, with spans up to 50 feet. WRIGHT cranes are conservatively engineered to be as safe or safer than any competitive crane for comparable service. All have a minimum 5-to-1 safety factor.

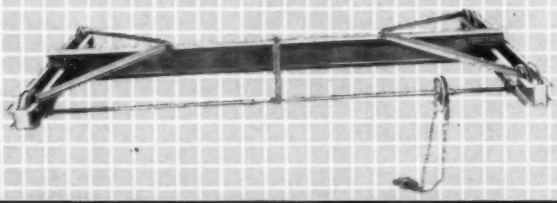
FEATURES OF WRIGHT HAND-OPERATED CRANES

End Trucks are of welded steel channel construction. Heavy channel diaphragms are jig-welded and bored to insure perfect alignment of axles, wheels and drive shaft. Squaring shaft is made of ground and polished steel, geared to end trucks for uniform travel of crane ends.

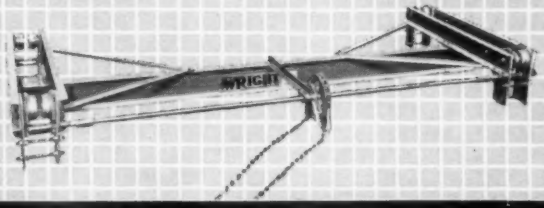
Timken Tapered Roller Bearings • Two opposed bearings on each truck wheel absorb the radial and thrust loads imposed by normal crane operation.

Hand Wheel is keyed to squaring shaft. Wheel operated by a pendent chain. Guide protects chain and at the same time prevents it from gagging or leaving wheel pockets.

B-9 TOP RUNNING SINGLE BRIDGE CRANE

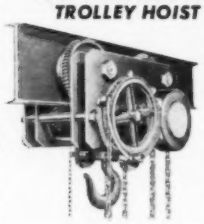


B-36 UNDERHUNG SINGLE BRIDGE CRANE



BUILD LOW-COST, HAND-OPERATED CRANES FROM THESE WRIGHT COMPONENTS

LOW HEADROOM TROLLEY HOIST



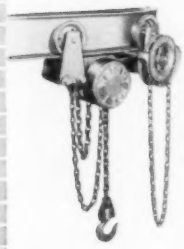
The Type 600 is a special-purpose hoist designed for situations where extra-close headroom is encountered. The trolley has Timken Tapered Roller Bearings and steel side plate construction. Available either plain or geared. Has capacity of 1½ to 24-tons.

B-9 END TRUCKS

For top running single bridge cranes. Precision-ground tapered tread double-flanged wheels are cast of special car wheel iron. Tread is deep-chilled to a hardness of 450-500 Brinell. Wheels automatically center and align themselves, keep crane from skewing.

WRIGHT ELECTRIC CHAIN HOISTS

Has the fewest working parts of any power hoist available! Alloy load chain is wick-lubricated. Drop-forged alloy steel wheel, hooks, coupling. Ball bearings. Double braking system. Comes in two capacity ranges: Single Chain (300 to 2000 lbs.); Double Chain (3000 to 4000 lbs.)



ARMY-TYPE TROLLEY HOIST

Recommended for close headroom service using a WRIGHT Safeway hoist suspended from a load bar rigidly attached to a stiff side plate trolley. All wheels have chilled tread and run on two Timken Roller bearings. Fits wide range of beam sizes. In geared or plain.

B-36 END TRUCKS

For underhung single-bridge cranes. Can be adjusted for a variety of standard I beams, or specially made for wide-flange beams. Wheel treads chilled for long service. Two Timken Tapered Roller Bearings per wheel, mounted on stationary axles.

WRIGHT JIB CRANE

A labor-saving addition to any plant for supplementary use to a regular traveling crane or monorail track, or for use in bays, on the sides of the shop, etc. The hinge plates are fitted with Hyatt Roller bearings or bronze bushings. One complete set of fittings comes packaged in separate carton.

WRITE US FOR COMPLETE INFORMATION

Complete information about all these WRIGHT products is available by writing our York, Pa., office. For information on specific items listed below, please refer to booklet number.

DH-43B • B-669 Cranes
TWH Trolley Hoist
Underhung Trolley Hoist

DH-227 • B-516 Cranes
E-58 • 2-Motor Electric Hoist
DH-431C • Crane Drive Unit
DH-468A • B-9 Cranes
DH-455B • B-36 Cranes
DH-241B • Low Head-Room Hoist
DH-269D • Army-Type Hoist
DH-347A • B-9 End Trucks
DH-348C • B-36 End Trucks
DH-73A • Electric Chain Hoist
DH-300A • Jib Cranes

For more facts circle 508 on Reply Card

Contractor tells why he preferred Armco Pipe

for industrial sewer installation

Long, 20-foot length of Armco SMOOTH-FLO Sewer Pipe is unloaded for installation at new Fastener Division Plant of National Lock Company.

"Long lengths and ease of joining made for good time; speed and economy were important on this job," says an official of Edwin Hogan & Sons, Inc., Rockford, Illinois, contractor who installed Armco Sewer Pipe for the new plant of the National Lock Fastener Division in Rockford.

More than 1500 feet of Armco SMOOTH-FLO® Sewer Pipe were installed on this big industrial project. The long lengths mentioned by the contractor were 20-foot sections of pipe. The high strength/weight ratio of Armco Corrugated Metal Drainage Structures makes it practical to handle and install these long sections. The result is reduced handling, fewer joints, fast completion, lower costs.

Once in the ground, Armco Structures provide other special advantages. Strong, tight joints assure continuing good alignment; guard against infiltration. Long, maintenance-free service is a fact. Write us for details about Armco SMOOTH-FLO Sewer Pipe and other Armco Drainage Structures. Armco Drainage & Metal Products, Inc., 5438 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.

ARMCO®

Making strong, tight joints is simply a matter of bolting on the coupling band—curved to match the pipe corrugations.

For more facts circle 509 on Reply Card

Hall Industrial Water Report

VOLUME 6 JULY 1958 NUMBER 4

Almost 3,000 Billion Gallons of Water

are used each year by the U. S. chemical industry. For all U. S. industry the volume is more than 11,000 billion gallons per year. At this rate industry could drain Lake Erie in eighteen months.

Not all of this water requires treatment but a substantial portion does. Clarification may be all that is necessary for some uses. For others softening, silica removal or alkalinity adjustment may be required. Where very pure water is needed, demineralization may be indicated. Waste water may have to be treated before disposal or to save valuable materials for re-use.

Hall Laboratories has specialized on water problems for over thirty years. Experienced Hall engineers are ready to work with you on your water problems and to help you decide what treating procedures you need in your operations.

Weekly Shutdowns Eliminated

Two boilers in a pesticide manufacturing plant were shut down every weekend for mechanical cleaning. The hard well water used for boiler feed produced scale at a rapid rate despite attempts to prevent this with a "gadget" and later with a cure-all boiler compound.

Then the plant decided to let Hall Laboratories help. The Hall field engineer, with the cooperation of the operating men, soon established conditions in the boiler water which not only prevented new scale formation but removed the old scale at a controlled rate. Now the boilers have operated one year without a shutdown due to scale.

Retubed in Five Months

Three years ago a company operating chemical tank trucks installed a new package boiler for heating and steaming of dirty tanks. Against the recommendation of Hall Laboratories a gadget was purchased to protect the boiler from scale and corrosion.

Five months later a hurry-up call came for a Hall engineer. The boiler had had to be retubed because of corrosion.

Hall engineer M. E. Osmond immediately established water conditions which would protect the boiler. When it was inspected after five months' operation, everyone was pleased to find it clean and free from further corrosion.

The operating men were so impressed that they called on Hall Laboratories again when they ran into trouble. Aluminum tanks, which they were cleaning with a strong caustic soda solution, were corroding. Hall recommended Calgonite® because it is an alkaline detergent which cleans greasy surfaces without attacking aluminum. Once again everyone was pleased when the Hall recommendation solved the problem.

Leaky Baffle Causes Foaming

A Pennsylvania chemical plant suddenly was troubled with severe foaming and carryover of boiler water. When the operators called Hall engineer J. Printz they explained that the trouble was occurring in spite of the fact that the concentrations of phosphate, sulfite, alkalinity and dissolved solids were normal.

Printz collected a sample of boiler water and noticed that it contained a greater amount of suspended solids than normal. He suspected this of causing the foaming.

Why there was so much suspended solids in the boiler water became apparent on investigation. The boiler had operated for awhile with a leak in a furnace baffle which let furnace gases short circuit to the stack without following their normal path through the furnace. This upset circulation in the boiler and permitted sludge to settle out in a section of abnormally slow circulation. The difficulty came after the baffle was repaired when normal circulation stirred up accumulated sludge.

After the boiler was drained and washed to get rid of the sludge, no more carryover occurred.

Special Silica Problem Solved

The Hall engineer was handed a real puzzle when a New England chemical plant asked him to explain why silica deposits were building up in the steam line from a 200-psig pressure boiler and on the diaphragms of the turbine which used the steam. He knew that volatilization of silica in steam does not occur at 200 psig pressure. Something unusual had to be going on. Boiler water silica concentration was normal. The deposits contained small amounts of some salts normally present in boiler water but no phosphate.

A search led to the nitrate converters. In these units water is flashed into steam. This steam at 460°C is introduced to the drum of the 200-psig boiler above the water level. There it mixes with the steam generated in the boiler and goes on to the turbine.

The feedwater to the converters was found to be high in silica. The source of the silica was finally traced to some contaminated condensate from process which was being introduced to the converter feedwater. In a case like this only the experience and training of the Hall engineer enabled him to help the operating men locate the difficulty quickly.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information on how the Hall System can help you solve your particular water problems, write, wire or call address below.

Water is your industry's most important raw material. Use it wisely.

HALL LABORATORIES

DIVISION OF HAGAN CHEMICALS & CONTROLS, INC.
HAGAN BUILDING, PITTSBURGH 30, PENNSYLVANIA
DIVISIONS: CALGON COMPANY, HALL LABORATORIES
IN CANADA: HAGAN CORPORATION (CANADA) LIMITED, TORONTO

Hall Laboratories—Consultants on Procurement, Treatment, Use and Disposal of Industrial Water

For more facts circle 510 on Reply Card

as at Lever Brothers begins with a

LEVER BROTHERS COMPANY
LOS ANGELES

Here's the expected performance of seven OTIS Freight Elevators at the LEVER BROTHERS COMPANY plant at Los Angeles. Five 10,000 pound duty cars are constantly carrying raw material up from the ground floor for gravity processing. One of these cars and a 4,000 pound duty car are used for warehousing finished products. Another 2,500 pound duty car handles material for the laboratory and doubles as a passenger car to the cafeteria.

OTIS Maintenance—through the local OTIS office—assures trouble-free elevator service at LEVER BROTHERS.

Trouble-free freight elevator service starts with a FREE Otis Maintenance Survey and Estimate. Our approach is illustrated at the right.

In addition to freedom from shutdown costs, you'll be freed of unexpected, expensive repair bills. There's just one fixed monthly charge. It can be budgeted. It's adjusted annually, up or down, on labor and material costs only. And never because of the age or condition of the equipment.

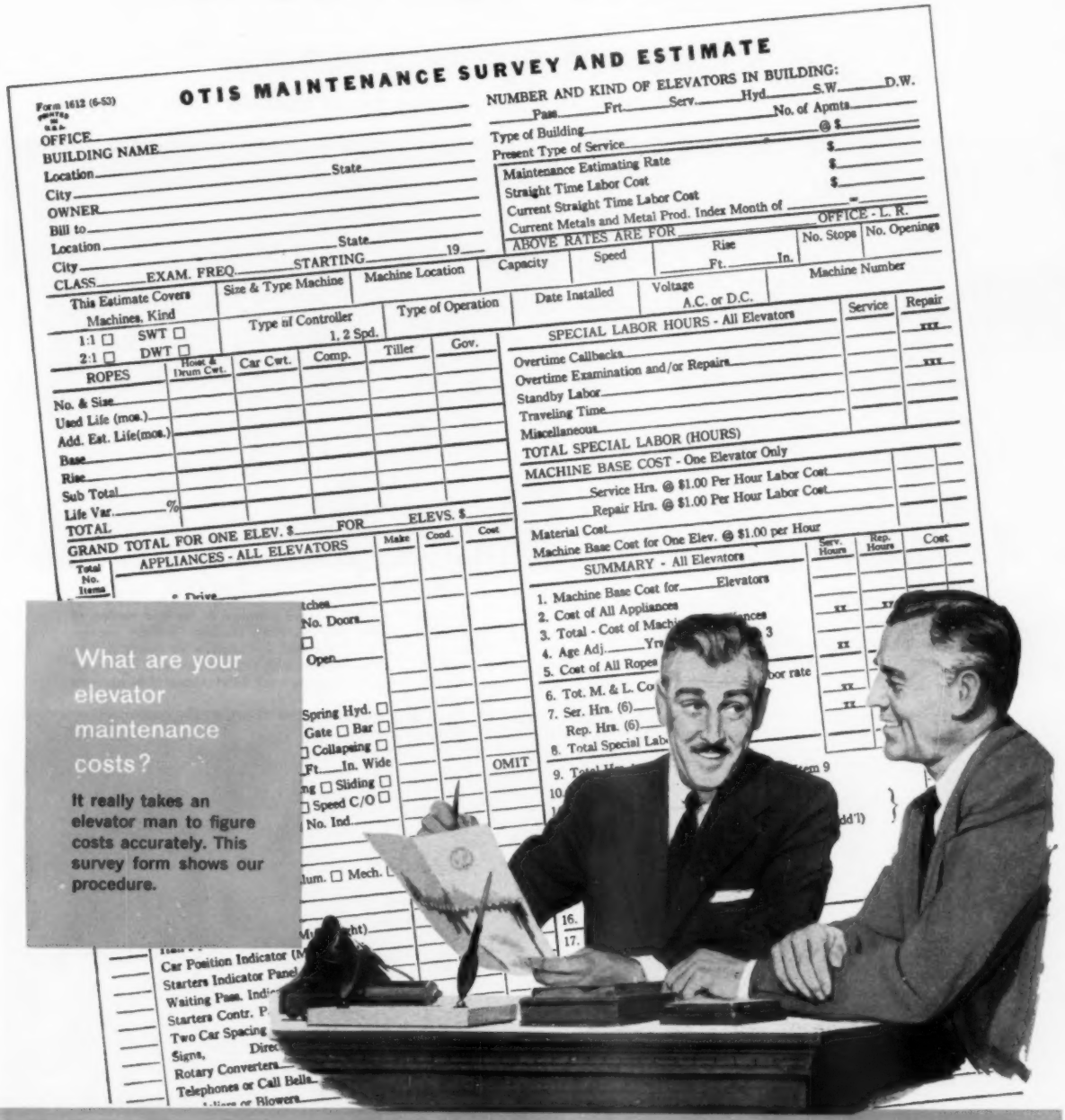
Otis **freight elevator**

"ENGINEERED SERVICE BY THE MAKER"

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N.Y.

trouble-free elevator service

FREE OTIS maintenance SURVEY

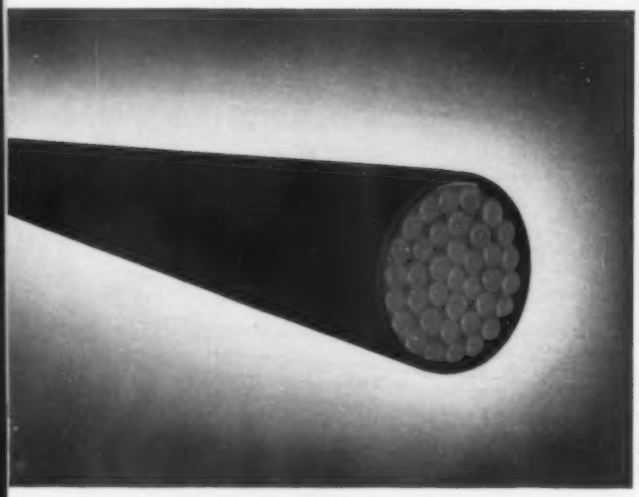


maintenance "that keeps freight elevators running like new"

OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

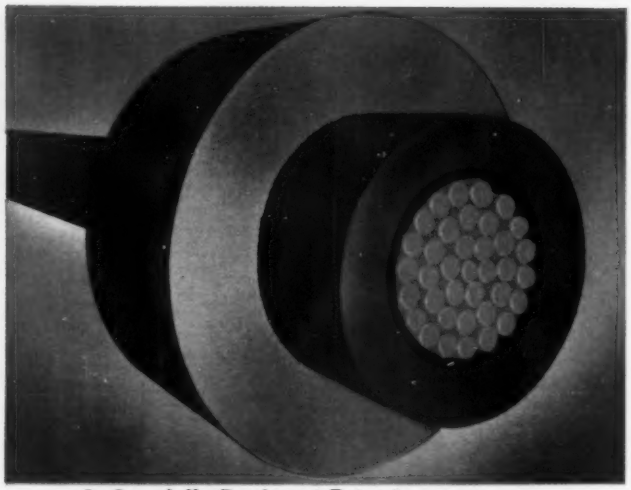
For more facts circle 511 on Reply Card

How the Nepco Process makes Butyl better



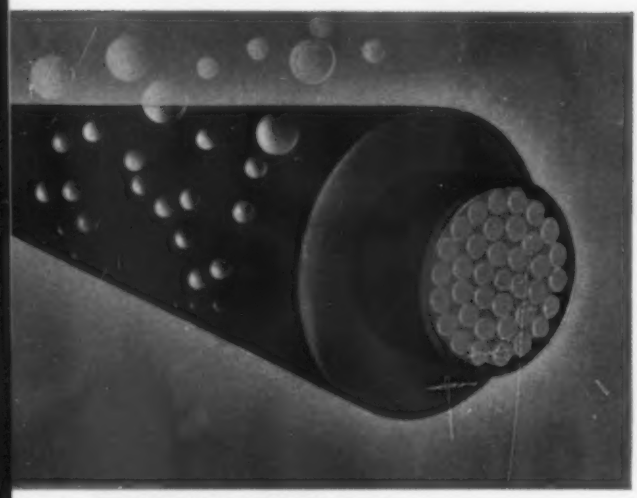
1. Vacuum Chamber Core Cleaning

All cores or copper stranding which in high voltage applications is normally wrapped in a special semi-conducting impregnated tape is passed through a high vacuum chamber to "boil-off" absorbed gases and moisture from the core.



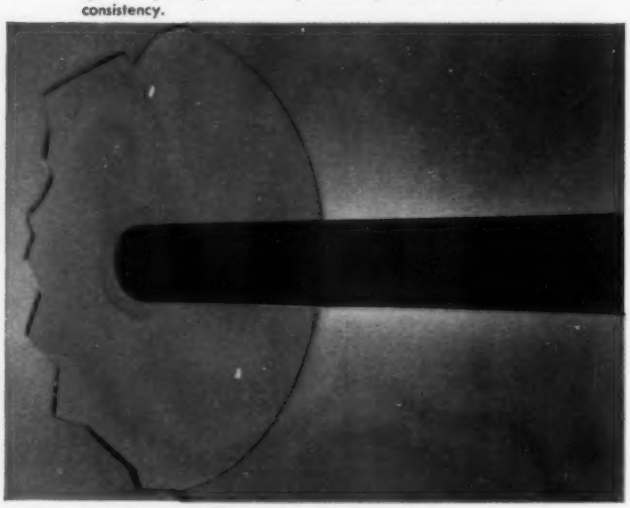
2. Specially Designed Extruders

After investigation, NE selected extrusion as the best method of applying a reliable dense, uniform insulation without troublesome interfaces. Since standard extruders were erratic in their capacity to process Butyl rubber, NE installed new equipment specifically designed to slowly work Butyl rubber at its optimum consistency.



5. Fugitive Vulcanizing Agents

Vulcanizing agents that leave the by-products of the vulcanizing action in the insulation reduce cable service life and electrical stability. NE has developed fugitive vulcanizing agents with volatile decomposition by-products that can be eliminated from the cable construction.



6. Pressure Vessel Vulcanization

NE Butyl is continuously vulcanized at over 400 degrees in a specially designed 200 foot pressure vessel . . . long enough to permit thorough saturation of the reactive centers and to allow the Butyl to interbond with the semi-conducting strand shielding tape to form a continuous mass.

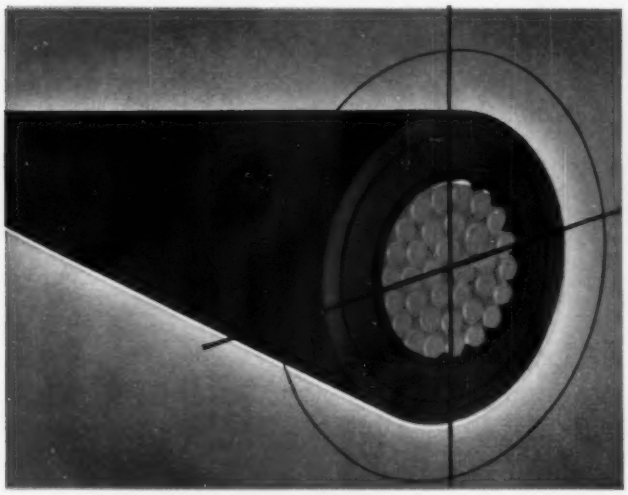
don't say <u>any</u> wire

Butyl rubber has inherent characteristics that make it an ideal insulating material for high temperature, high voltage wire and cable. It has outstanding resistance to heat, ozone and moisture.

To take full advantage of these characteristics requires special know-how and special equipment on the part of the wire and cable manufacturer. Here are eight things which National Electric does to get the best out of Butyl rubber and make NE Butyl insulated wire and cable the most dependable on the market.

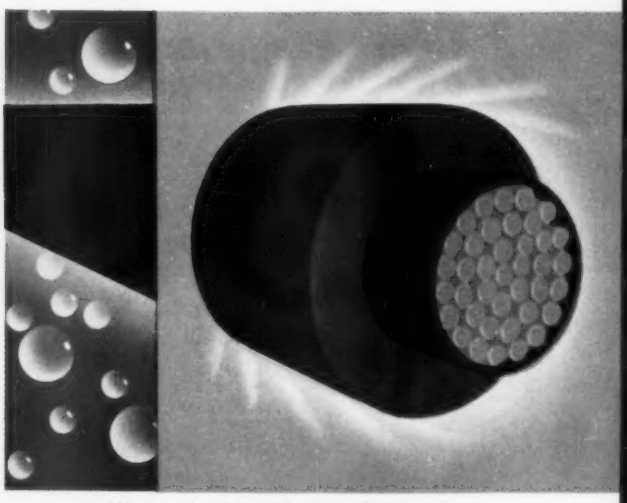
National Electric Products

Pittsburgh, Pa.: 2 Plants • 12 Warehouses • 41 Sales Offices



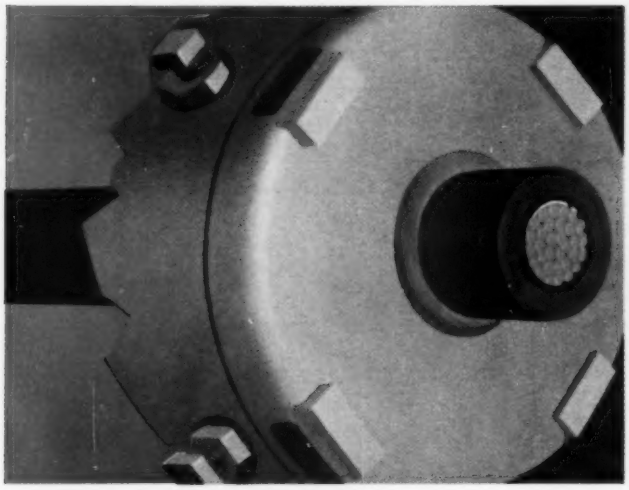
3. Controlled Concentricity

Every foot of cable is checked by a special monitoring station to maintain a perfectly centered core and uniform wall thickness before the material enters the vulcanizing chamber.



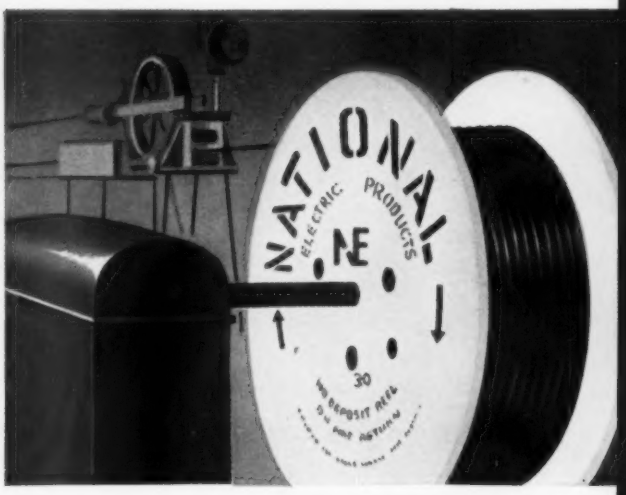
4. Water Cushion Processing

NE Butyl Rubber rides into the vulcanizing chamber through a high pressure water seal that molds the rubber uniformly onto the cable, impregnates the interstices of the shielding tape before vulcanization.



7. Pressure Vessel Cooling

Perhaps the most important part of the Nepco process. NE Butyl insulated cable is slowly cooled in a second pressure vessel under the same pressure at which it was vulcanized. This cooling under high pressure forces gaseous by-products out of the insulation . . . permits the use of volatile vulcanizing agents which leave no harmful residuals behind.



The inherent inertness of the Butyl rubber polymer permits the insulation to be compounded and vulcanized to a much tougher and mechanically stronger material.

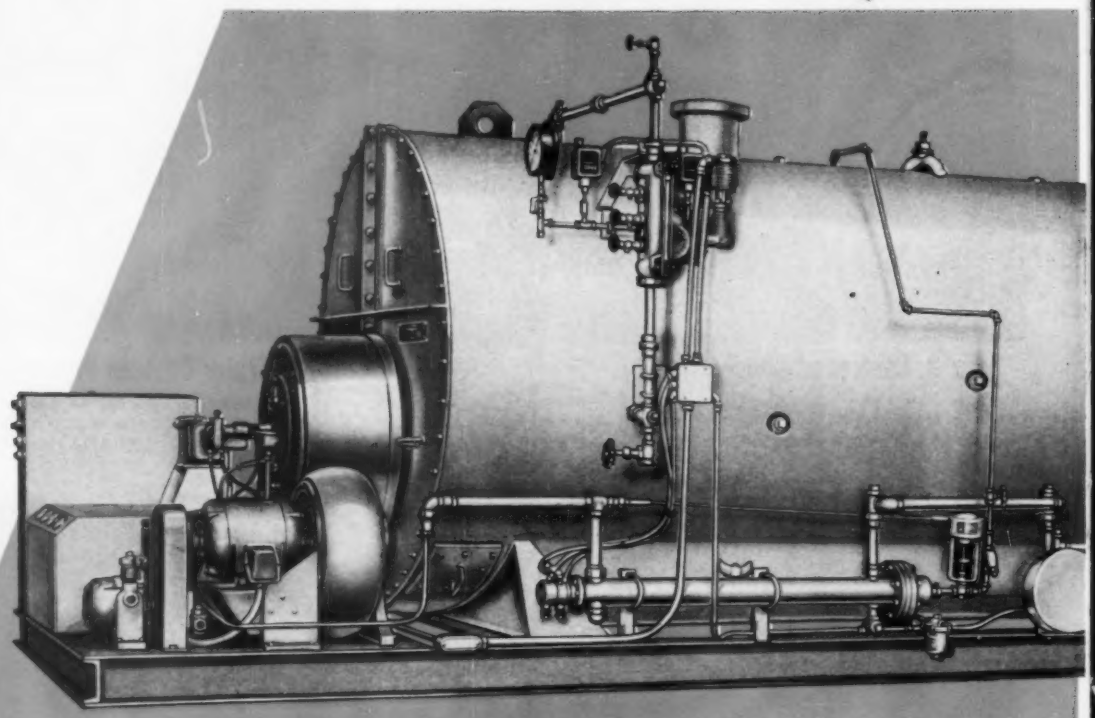
A typical National Electric Butyl formulation has at least twice the tensile strength specified for an oil base insulation and will maintain this margin of superiority during long term accelerated service tests. That's why when you plan to install Butyl rubber insulated wire and cable . . . don't say *any* wire . . . say NE Wire.

. . . say NE wire

For more facts circle 512 on Reply Card

ERIE CITY FT

the small boiler package



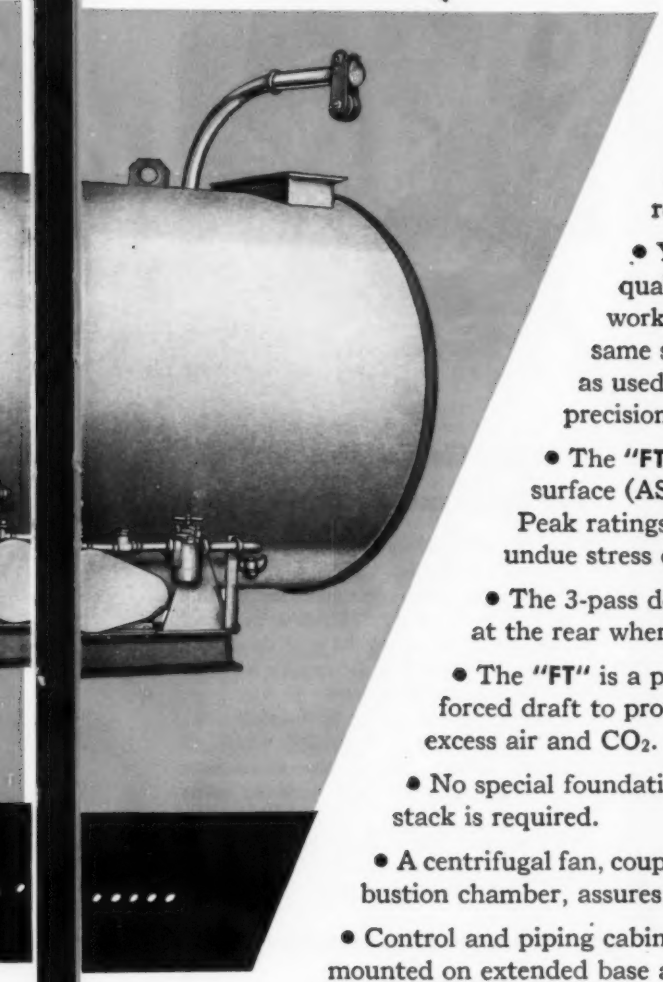
You can depend on Erie City for sound engineering.

ERIE CITY
117 Years in Steam Generation

ERIE CITY IRON WORKS • *Erie, Pa.*

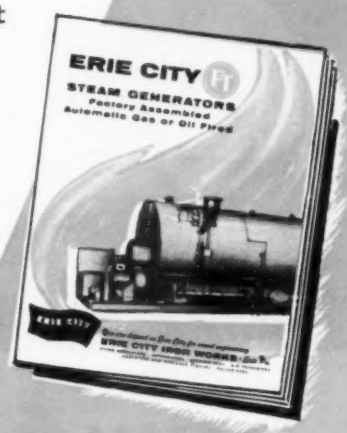
STEAM GENERATORS • SUPERHEATERS • ECONOMIZERS • AIR PREHEATERS
UNDERFEED AND SPREADER STOKERS • PULVERIZERS

for "PUSH BUTTON" steam with big boiler quality~~~



Backed by over a century of experience manufacturing high pressure water and fire tube boilers — the **"FT"** is manufactured, assembled, completely wired, piped and *factory fire tested.* It comes to you ready to go to work.

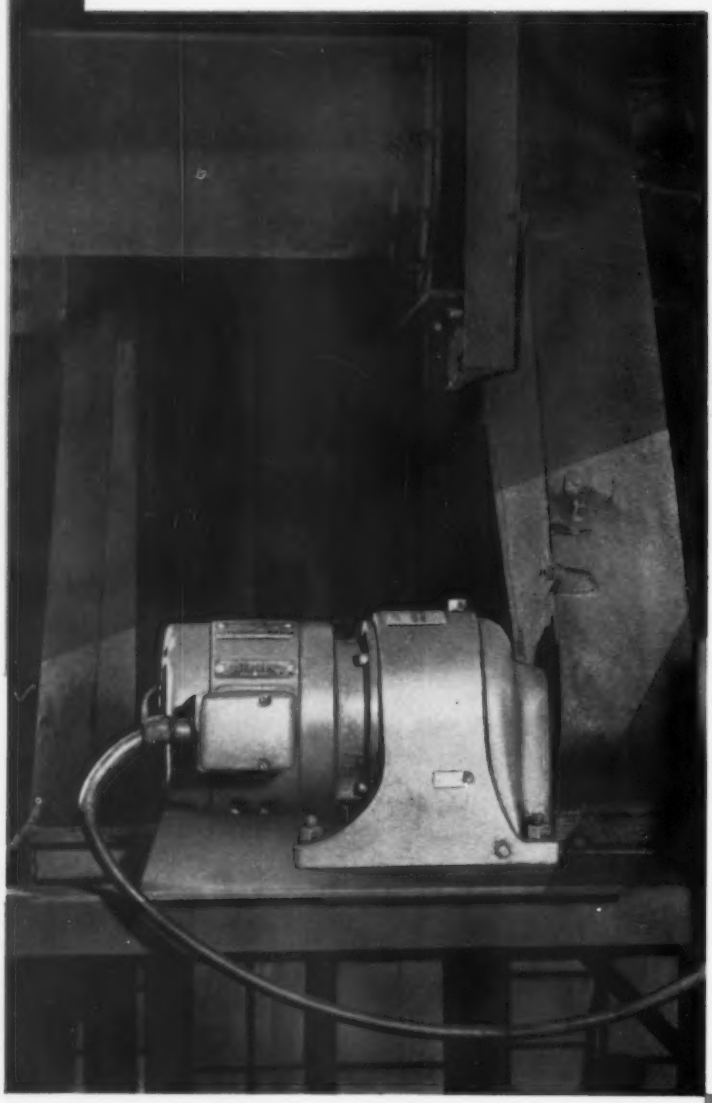
- You can be sure that the **"FT"** uses top quality materials — the same skilled workmanship — the same welding — the same stress-relieving and X-ray techniques as used on Erie City high pressure, precision built industrial power boilers.
- The **"FT"** has 5 full square feet of heating surface (ASME basis) per developed hp. Peak ratings are easily attainable with no undue stress on the boiler.
- The 3-pass design places the gas vent at the rear where it belongs.
- The **"FT"** is a pressurized unit using forced draft to provide precise control of excess air and CO_2.
- No special foundation nor expensive stack is required.
- A centrifugal fan, coupled to a closed combustion chamber, assures quiet operation.
- Control and piping cabinets are mounted on extended base away from heat and vibration.
- Every safety device is provided including indicating lights for "Power On"— "Ready"—"Pilot On" and "Main Flame."
- For the complete description of this top quality **"FT"** package that may cost a little more — but is worth it — write for SB-564J.



Did you send for your copy of CATALOG SB5683G

For more facts circle 513 on Reply Card

Tight space? Perfect place for a Link-Belt Gearmotor



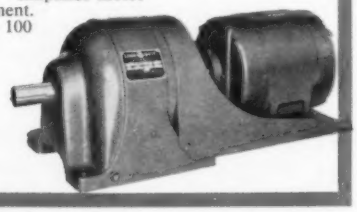
Maintains life-long alignment with flange-mounted NEMA motors

Here's a speed reducer right in step with industry's campaign for higher productivity in less space. Because its gear trains incorporate a minimum of parts . . . because its motor is directly connected to the gear drive with a flange—the Link-Belt Gearmotor is the ultimate in compactness.

Imagine how these same features cut costs. The flange connection eliminates additional coupling devices. Simple gear trains have fewer parts to wear, to service, to invite trouble.

You'll find them in Book 2447. Call your authorized Link-Belt stock-carrying distributor or nearby Link-Belt office.

LINK-BELT MOTOGEAR—for bracket-mounting all makes and enclosures of foot-type NEMA motors — simplifies motor replacement. Sizes to 100 hp.



LINK-BELT

SPEED REDUCERS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14.808

For more facts circle 514 on Reply Card

BULLETINS just released and of immediate plant interest

On pages 169-170 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

PLANT CONSTRUCTION AND MAINTENANCE

101 Pole-Type Buildings — Easy steps in building pole-type industrial and other buildings are presented in this 8-pp pocket-size booklet. Deals with uses of pressure-treated, rot and termite resistant poles and lumber. Contains practical step-by-step guide, with diagrams, covering site location, pole setting, roof construction, splash boards, application of siding. Wood Preserving Div., Koppers Co., Inc.

102 Gypsum Roof Deck—Firestopper poured-in-place gypsum roof decks are described in 8-pp Form 4467. Discusses strength, light weight, other advantages of these roof decks and illustrates design and installation details. Includes safe load data and architectural specifications. Table gives approximate nail holding power of slabs. Bestwall Certain-Teed Sales Corp.

103 Face Brick — Brochure B-158 contains a set of 24 color reproductions which illustrate the wide range of glazed and unglazed facing brick for all types of interior and exterior walls. Also included is detailed information regarding size, color and availability of Standard, Roman, Norman and SCR brick. Natco Corp.

104 Movable Wall System — Illustrated in full color, this 12-pp brochure presents key features, architectural specifications and sectional drawings of company's Type HP movable wall system. This system is designed to combine low initial cost with many refinements of premium-priced walls, and these are discussed. Some design variations are diagrammed, and photos of components are included. The E. F. Hauserman Co.

105 Expanded Metal Uses — This 10-pp "George Nelson Sketchbook" presents in sketch-form current and projected uses of expanded metals. Sketches are those of noted industrial designer and they illustrate some unusual applications for this strong, lightweight aluminum or steel material. United States Gypsum Co.

106 Aggregate Concrete — Reporter 14, 20 pp, illustrates wide use of lightweight aggregate concrete in modern construction. Photos and job stories demonstrate its use as a strong, durable structural material for columns, beams and floor slabs, others. Job stories cite role played by Pozzolith in providing adequate workability for proper placement while economically maintaining sufficient strength. The Master Builders Co.

107 Insulation Board — Asbestolux, a lightweight, fireproof insulation board, is described in this 12-pp brochure. Presents illustrations of dozens of existing installations in a variety of buildings. A description of installation procedures is accompanied by detailed scale drawings. Diagrams show fire protection afforded in some typical applications. Also discusses properties. North American Asbestos Corp.

108 For Exterior Masonry — Subjects covered in this 10-pp booklet on acrylic emulsion paints for exterior masonry include an outline of the development of water-thinned paints, acrylic paint formulations, outdoor applications to various types of surfaces. Also provided are summaries of fourth and fifth year exposure findings on mildew resistance, color retention, and other properties. Rohm & Haas Co.

109 Acrylic Latex Paints—This 30-pp technical latex manual outlines technology of acrylic latex paints for interior use. Gives summaries, tables and formulations of each type of interior acrylic paint, including sealers, primer sealers, white top coats, tint bases and colored paints. Application of the paints is covered, as is equipment for handling the acrylic emulsion in bulk. Rohm & Haas Co.

CHAINS AND WIRE ROPE

110 Sling Chains—Registered sling chains—1-leg, 2-leg, 3- and 4-leg styles plus necessary hooks and attachments—are described in 28-pp Catalog DH-105. Lists such points as ordering information, safety factors to consider when ordering sling chains, specifications, care, table of wear and inspection procedures. Recommended working load limits given. American Chain Div., American Chain & Cable Co., Inc.

111 Wire Rope Use, Care—An information piece for any plant engineer concerned with wire rope, this 36-pp handbook gives up-to-date pointers on the use and care of wire rope. Tells how to select right rope for specific needs, and covers methods of socketing, splicing and installation, and safety factors. Typical causes of wire rope failure are given, and chapters are devoted to lubrication, and inspection. Wire Rope Corp. of America.

112 Wire Rope Splicing — Directions for making splices in wire rope are pictorially presented in this 34-pp bulletin. Gives directions for splicing an eye into the end of a wire rope, for making a "rolled in" eye splice, for making an endless or long splice in wire rope, for splicing wire rope having independent wire rope core. Also discusses efficiencies of wire rope attachments, making a wire rope grommet, and includes directions for attaching sockets to wire rope, other subjects. Union Wire Rope Corp.

MATERIALS HANDLING

113 For Pneumatic Conveying — Bulletin FK-26A, 16 pp, describes and illustrates the applications of pneumatic conveying systems designed for handling dry bulk materials. Photos show various stages of operation and line drawings detail construction and operation of systems. Fuller Co.

114 Overhead Conveyor — Catalog CDA is a 44-pp technical manual containing data needed to engineer any size overhead conveyor system. Features such as low cost, ease of installation, quiet operation and long life are fully detailed, and photos of typical installations and illustrations of components included, as well as dimensional diagrams. Conveyor Div., The American MonoRail Co.

116 Piano Hinge Conveyors — Brochure SB-70 covers general information on precision piano hinge steel belt conveyors and applications in the handling of press scrap, turnings, steel parts, chips and parts feeders. Specifications are included as well as photos of installations. Prab Conveyors, Inc.

117 Guide To Trucks—This 16-pp industrial truck selector guide shows how to set up material handling systems in relation to specific plant layouts and products produced. Describes 20 basic truck types and gives specifications of 100 models, indicating how each is applicable to particular handling requirements. Factors such as capacity, aisle and floor space, hauling distance, and others are explained. Automatic Transportation Co.

118 Lift Truck Selection—A series of pneumatic-tired lift trucks in the 3000- to 5000-lb capacity range are discussed in terms of performance, construction, maintenance and service in 14-pp Form 1500. Illustrated with on-the-job photos, bulletin shows how these trucks are designed to get more work done, can be serviced with minimum downtime and offer other advantages. Shows attachments and accessories available. Hyster Co.

119 Carrier Specifications—Provided in this 6-pp folder are standard specifications for company's line of fork lift trucks. Some 14 basic models are covered, including gasoline, LP gas and diesel units. Also shown are industrial tractors and an electric pallet truck. Towmotor Corp.

120 To Know the Truck—Information required in getting the right truck for the job is provided in this 12-pp book on pneumatic tired trucks of 1000- and 2000-lb capacity. In addition to discussing performance, ability to stand up in service, and serviceability, booklet analyzes features of the truck. Also lists 36 items of optional equipment available. Hyster Co.

121 On Hand Trucks — Factors to consider in initiating a materials handling program are outlined in 12-pp Bulletin 5008-H. Selection of right truck for the job, determining truck capacity for loads to be handled, and other factors, such as choosing be-

BULLETINS

(Begins on page 21)

tween pallets or platform loading, are covered. Specification table of both platform and pallet type hand lift trucks is included. Automatic Transportation Co.

122 Diesel Crawler Tractor—Illustrations and text matter in 14-pp Catalog MS-1289 highlight features of company's HD-16 diesel crawler tractor. A gate fold permits a large cutaway view of both gear transmission and torque converter models. Also shown is matched equipment available for this tractor. Specifications are included, as well as two separate "spec" sheets. Allis-Chalmers Mfg. Co.

123 Transportable Elevator—Eight-pp Catalog 852-C describes a transportable elevator for maintenance, construction, operational use. Described as meeting all safety regulations, this demountable personnel elevator travels on a single vertical monorail, lifts men or materials up to 250 ft. Safety features are stressed, specifications included. Hawkeye Products Corp.

124 Crane Rails — Catalog 464, 24 pp, combines pictorial features of an illustrated brochure with statistical data of a handbook to describe the manufacture of crane rails. Provides directions for jointing, welding, selection of proper section, and other information. Also included are illustrations, diagrams, tables and specifications. Bethlehem Steel Co.

125 Casters and Wheels — Fully illustrated with photos and drawings, this 32-pp revised catalog contains detailed information on construction, sizes and applications for manufacturer's line of casters and wheels. Specification tables present data on rated capacities, types of wheel, weights, etc. The Rapids-Standard Co., Inc.

LUBRICATION

126 Lubrication Equipment — Fully illustrated, 32-pp Catalog 65 covers design and engineering features of air-motor operated lubricant pumps and allied equipment. Complete with lubricant-output-performance and selection charts, catalog fully details advantages and applications of this equipment. Lincoln Engineering Co.

127 Guide to Lube Use — Bulletin 116 is a little 8-pp guide showing where and how Molykote lubricants should be applied. Chart indicates equipment on which the lubricant promises to perform well, method of applying it and benefits to be expected. The Alpha-Molykote Corp.

128 On Colloidal Dispersions—"The ABC's of Colloidal Dispersions," 12 pp, gives answers to questions frequently asked about colloids and lists technical bulletins available on uses of colloidal graphite, other materials. Discusses graphite, colloidal graphite, advantages of colloidal dispersions, why graphite is dispersed in various fluids, etc. Acheson Colloids Co.

VALVES AND FITTINGS

130 Bronze Valves—Catalog 158, 12 pp, describes company's complete line of bronze valves for a variety of industrial and other applications. Separate sections are devoted to heavy duty valves, heating specialties, and solder joint valves. Dimensional information included. Hammond Brass Works.

131 Flow Regulating Valve—Bulletin 1053 describes and illustrates the flow regulating valve which offers two distinct advantages: use of a horizontal rotating lever shaft, and accurate balance in service. Included in the bulletin are specifications on sizes, pressures, and materials of construction. Copes-Vulcan Div., Blaw-Knox Co.

132 Control Valves — Digest Catalog 58 is a 20-pp quick reference on control valves, defining the control of air power and its applications. Valves are listed by function rather than by series. It includes an information section on fundamentals of pneumatics and various applications of compressed air. Ross Operating Valve Co.

133 Steel Gate Valves—Engineering features and performance of company's forged steel gate valves are illustrated and described in Circular 607. Cutaway view illustrates component parts. Lunkenheimer Co.

134 Relief Valves—Eight-pp Bulletin 5200-A describes features of multiple disc relief valves for steam systems. Specifications for vertical, horizontal and angle styles in sizes from 4- 48., 0-25 to 0-100 psig pressure. Installation diagrams, data on selecting and specifying included. Cochrane Corp.

135 Pipe Fittings — Eight-pp Catalog 2-PF gives data on ductile iron pipe fittings, including applications, prices, safety factors and service ratings. Also gives comparative physical properties of pipe fitting metals. Provides data on impact testing. Fittings covered include pipe lock couplings, screwed and flanged fittings, others. The Kuhns Brothers Co.

136 On Tube Fittings—Catalog 056, 20 pp, covers straight-thread hydraulic tube fittings. Gives engineering details plus ordering and installation instructions on the line which includes elbows, tees and plugs in a variety of combinations. Engineering drawings of each type are included along with a table of dimensions for each size. Available taps and counterbores needed for proper installations of fittings are also featured. Flodar Corp.

MECHANICAL POWER TRANSMISSION

137 Adjustable Speed Drives—Packaged adjustable speed drives designed for converting alternating current to direct current are described in 14-pp Bulletin EN-64. Includes sketch of operation, illustrations of control and power conversion units, and of components and control stations, as well as tables of sizes and dimensions. Cutler-Hammer, Inc.

138 Improved Clutches — Electroclutches, compact, electrically operated devices for engaging and disengaging machinery gears and drives, are described in 20-pp Catalog 6304-1A. Gives examples of applications, provides data and specifications and summarizes general application information. This clutch is available in six basic designs with torque capacities up to 13,000 lb-ft. I-T-E Circuit Breaker Co.

139 Permanent Magnet Pulleys — Bulletin 1021 describes a permanent magnet pulley for tramp iron separation in belt conveyor systems. Performance advantages are detailed and a selection chart is included. Stearns Magnetic Products, Div. Indiana Steel Products Co.

140 Flexible Gear Couplings—Twenty-pp Catalog C-5 is a reference manual on flexible gear couplings. Details range of standard types and sizes, provides information on available special types. Sections of booklet are devoted to cost-cutting advantages, installations information, typical applications, lubrication requirements. The Sier-Bath Gear and Pump Co., Inc.

141 For Coupling Selection—Bulletin 56 describes standard gear couplings, flexible couplings, a new nylon gear coupling requiring no lubrication, couplings for fph motors with direct drives, several other types. Dimensions given. John Waldron Corp.

LIGHTING, COMMUNICATION

142 Fluorescent Ballasts — Bulletin GEC-983L, 20 pp, gives prices and data on various ballasts for fluorescent lamps. Included are a quick guide to ballasts, descriptive tables, cross section dimension diagrams, chart for suggested replacement of obsolete ballasts, installation and operating instructions and wiring diagrams. General Electric Co.

Postage-free Reader Service Cards make it easy to order catalogs. Cards are provided on pages 169-170.

143 Lighting Specifications — The 1958 edition of the RLM Standard Specifications Book is a 40-pp reference guide on industrial lighting units. In this edition, specifications for fluorescent and incandescent fixtures most widely specified have been strengthened in areas of efficiency, design and construction quality. New specifications include two- and three-lamp special service fluorescent units, three types of units utilizing 800 ma fluorescent lamps, others. Technical data has been simplified by incorporating all specifications pertinent to all fixtures into a new single "Specification 101." RLM Standards Institute, Inc.

144 Static Magnetic Annunciator—Bulletin 101 contains information on company's static-magnetic annunciator developed for monitoring complex automatic machine and continuous process operations. Includes section on typical logic functions of control elements, also provides typical logic diagrams, Panellit, Inc.

(More Bulletins on page 171)

let's take a second look at air compressor costs

Let's look at what Joy compressors have to offer in saving you money where it counts the most. Let's assume that all compressors are competitively priced . . . and go on from there.

eagle-eye the installation first . . . here's where specifying Joy saves a bundle. Why? Because Joy stationary compressors are "Packaged" units. They're shipped complete, ready to run without tedious, costly site assembly. Joy compressors need as little as one-half as much foundation. You can save up to $1000 on that item alone.

plus savings in maintenance . . . *All the wearing parts:* the cylinder liners, cross head guides, valves, etc., are replaceable at your plant, by your men. This is a Joy exclusive. No specialists needed, no fancy tools required. Joy engineered these compressors to run for years on minimum maintenance.

and on operation, we'll let the people who have used Joy compressors for years do our telling for us. Nope—no modesty . . . but the money they've saved in operating costs annually would sound unbelievable coming from us.

If you're frowning over the choice of your next compressors and what to do to save a needed buck . . . . . .

Take a second look and get in touch with a Joy Engineer. He'll show you how Joy saves you money on air. Write Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.

WSW I 7165-243

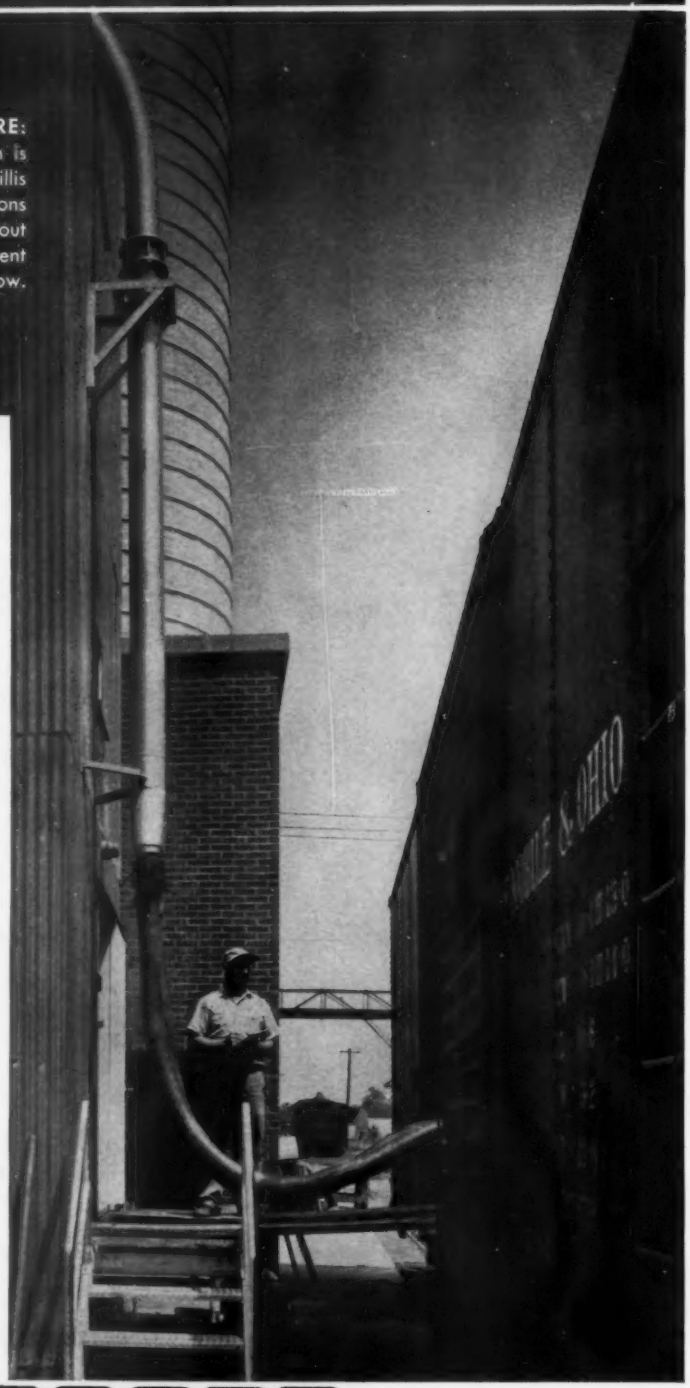
WRITE FOR FREE BULLETIN 243-15

JOY *Saves you money on AIR*

COMPRESSORS • FANS • DUST COLLECTORS

For more facts circle 515 on Reply Card

flowing air moves bulk materials better



AUTOMATIC PRODUCTION STARTS HERE: This compact Airstream Conveyor installation is at Easton (Md.) feed mill of J. McKenny Willis & Son, Inc. Self-cleaning system unloads 25 tons per hour of soft meals for animal feed without dust, waste or mixing of meals. Vertical movement requires no more power than horizontal flow.

Efficient bulk materials handling is a major factor in any modern plant. Outmoded handling methods put a costly kink in production processes which are otherwise smooth and automatic.

A Dracco Airstream Conveyor can provide air-smooth bulk handling to supplement your other up-to-date operations. Airstream systems are readily adaptable to control and any degree of automation is possible. Versatile intake devices permit unmatched mobility in unloading areas. One-man supervision, with flow regulated from a central control panel, replaces costly manual handling.

Airstream Conveyors are enclosed and self-cleaning, permitting movement of different materials in quick succession without dust, waste or intermixing. Conveying lines require little space, conform easily to existing plant layouts, can be installed out-of-the-way without expensive structural supports.

For more information on how flowing air can move your bulk materials better and cut handling costs, call or write:

DRACCO DIVISION OF FULLER CO.
4035 East 116th Street • Cleveland 5, Ohio

New 32-page brochure presents detailed information on how Dracco Airstream Conveyors have solved bulk materials handling problems. Write for Bulletin 530.

DRACCO *airstream* conveyors
dust control equipment

For more facts circle 516 on Reply Card

For more facts circle 517 on Reply Card ⟶

NEW from Standard Oil

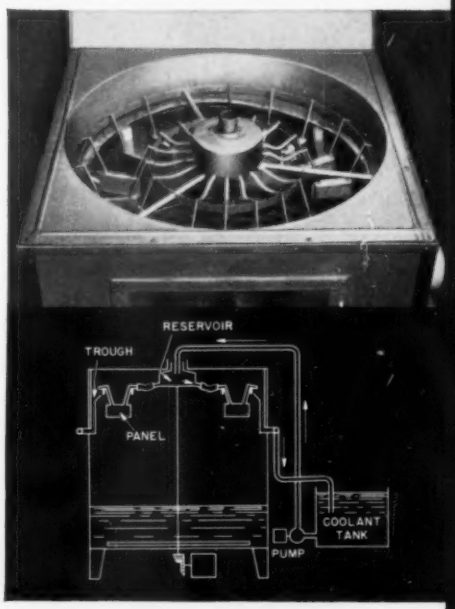
THE MAGIC BOX

Corrosion steals $5.5 billion from industry annually. Standard Oil is in the forefront of the fight to control this loss. Standard's research scientists have developed a new method for measuring the effectiveness of rust preventives. This new test takes less than one-twentieth of the time of previous tests—and is about three times as precise.

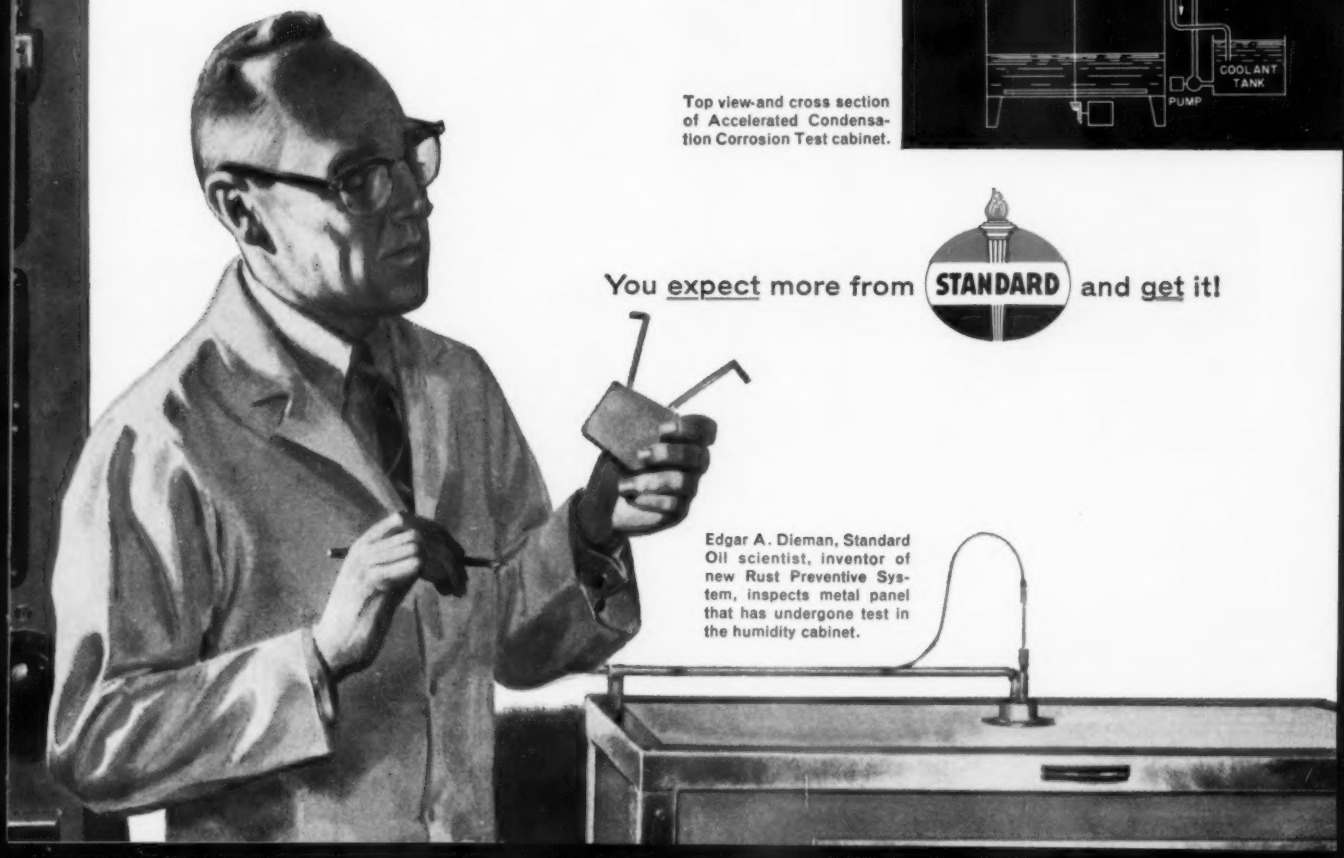
Using a controlled humidity cabinet for testing corrosion, these Standard research men installed a system for cooling metal test panels (previously treated with rust preventive) so that their surface temperatures are lower than the temperature in the cabinet. Temperatures of panel surfaces and of cabinet atmosphere are held accurately. Controlling the temperature of the panels controls the rate at which water condenses on them. This in turn (for the first time) permits accurate control of the amount of condensation on the panels. Rust preventives are more speedily and precisely tested. Science, as a result of this work, has a new tool with which to test corrosion.

This is the research pay-out industry receives from Standard Oil. This is the something extra that backs up the Standard industrial lubrication specialist who calls on you. This is the something extra found in the products he sells.

To know more about how Standard Oil industrial lubrication specialists—and Standard's research program—can help you, call the Standard Oil office nearest you in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.**



Top view and cross section of Accelerated Condensation Corrosion Test cabinet.



Edgar A. Dieman, Standard Oil scientist, inventor of new Rust Preventive System, inspects metal panel that has undergone test in the humidity cabinet.

You expect more from STANDARD and get it!

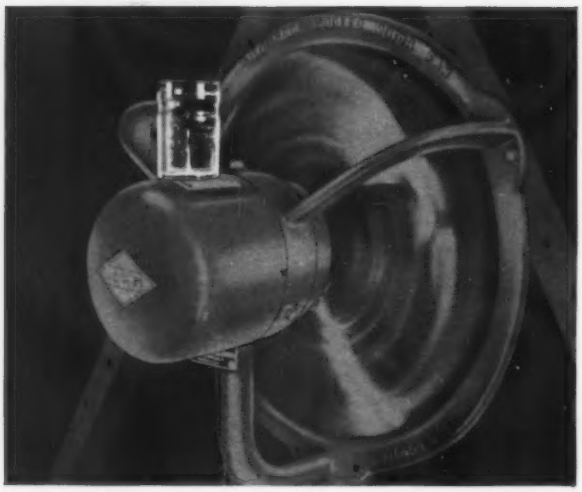
HOW MUCH VIBRATION IS ALL RIGHT?

When it's ventilating equipment...

When *you* specify ventilating equipment, what do *you* consider most important? What features do *you* insist on? What contributes most to the quality of equipment *you* want?

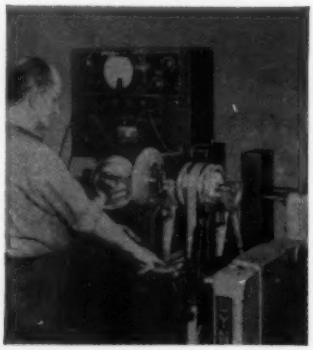
To nail down these answers for us, an independent research organization conducted a nationwide survey among consulting mechanical engineers.

Here's how ILG *fans and motors, stay vibration-free,*



Full Speed Ahead — and still not a ripple in the water. With Ilg direct-connected propeller fans you get operation as *vibration-free* as it's possible to be. Ilg's "One-Name-Plate" pledge of performance covers *both* the dynamically balanced, patented Type "Q" fan wheel and the permanently lubricated, self-cooled motor.

Ready with the Rotor! All rotating *parts* in Ilg-built motors are checked for static and dynamic balance. After final assembly, Ilg Motors undergo additional checks. Smooth, *vibration-free* operation assures long life—and a quiet one—for *all* Ilg Motors.



Checks and Balances. Ilg Centrifugal Fan Wheels—with Backward Curved (BC) Blades and Airfoil design—have to "check out" before being direct-connected to 3-phase or permanent-split capacitor, single-phase Ilg-built motors.

For fans built to satisfy your "specs"...

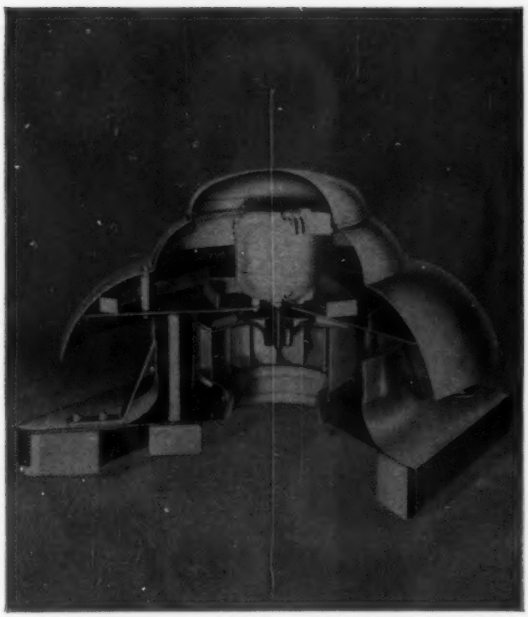
consulting engineers vote for vibration-free fans on 9 ballots out of 10

Results of the poll? Nine times out of ten *vibration-free operation* ranks foremost among those who specify fans and ventilating equipment.

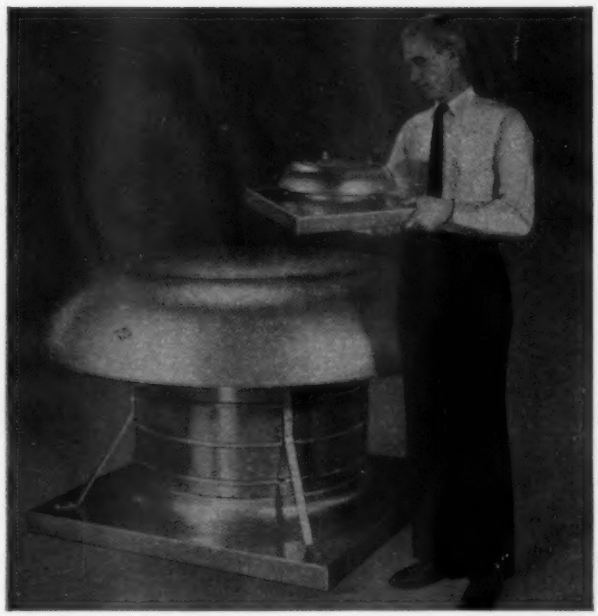
As shown below, Ilg Fans and Ventilators are as *vibration-free* as it's possible to be. But that's only *one* reason why it pays to choose Ilg. Not to be overlooked are these additional points preferred by consulting engineers: minimum maintenance, low operating costs, ease of repair, quietness.

For further details of why Ilg rates so high with those who specify, send for Catalog No. 153 on propeller fans, Bulletin No. 257 on Airfoil centrifugals, Bulletins 2301 and 2700 on power roof ventilators.

ILG *power roof ventilators cost less to operate*



Look Under the Hood of this Ilg Power Roof Ventilator and you'll see why it's such a popular purchase. Ilg Backward Curved Aluminum Airfoil Centrifugal Fans assure smooth, quiet air flow and low shock loss. Permanently lubricated, self-cooled, direct-connected Ilg Motors eliminate belt maintenance, friction losses, slippage.



David and Goliath? Just name the exhaust or supply propeller fan power roof ventilator that fits your capacity and kind-of-building needs—and Ilg has it. 11 different sizes, all direct-connected fan and motor for quiet, *vibration-free* operation and low maintenance. All components dynamically balanced for lifetime alignment.

specify ILG

ILG ELECTRIC VENTILATING COMPANY

2832 N. Pulaski Road, Chicago 41, Ill.

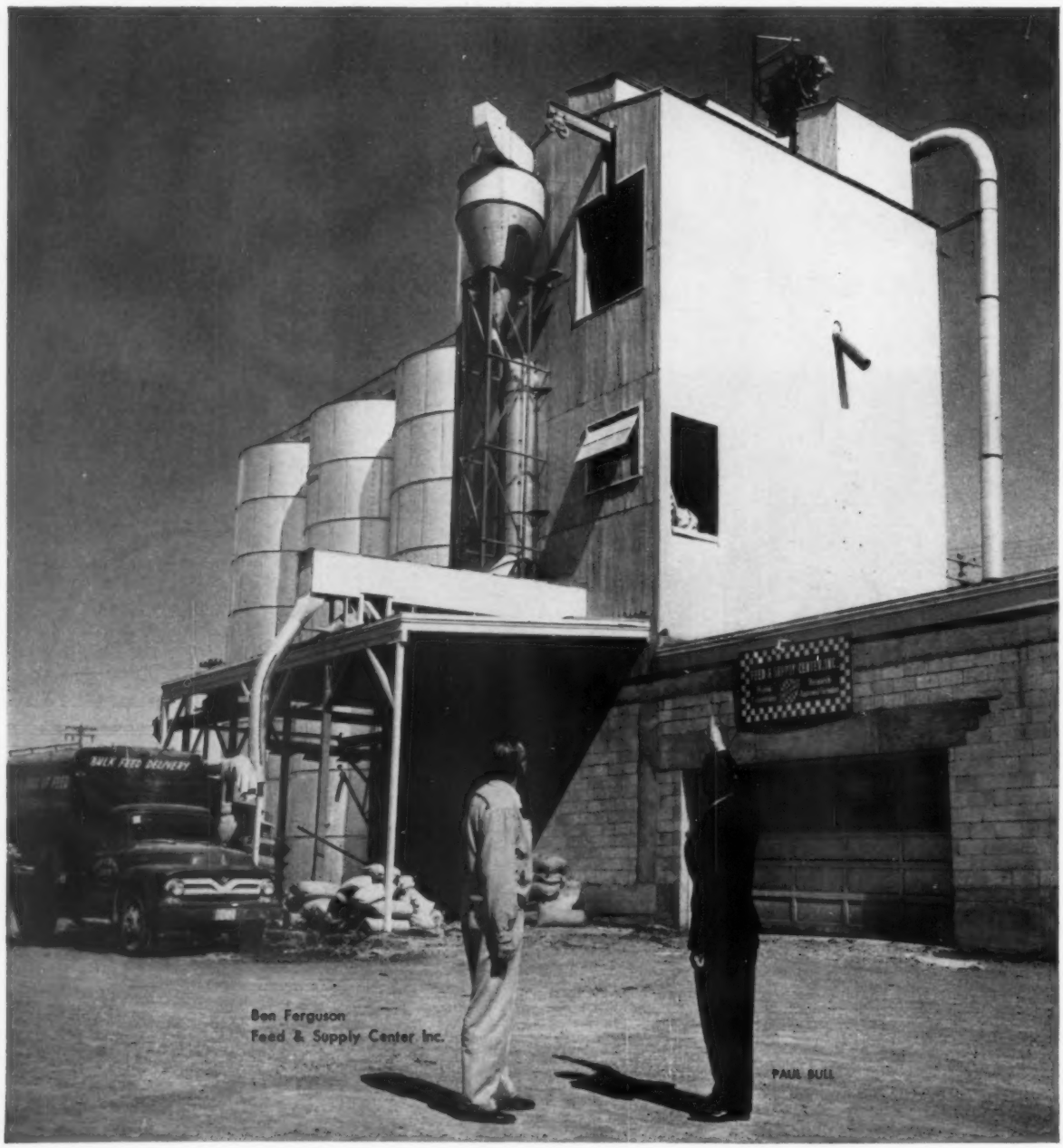
Offices in 57 Principal Cities

For more facts circle 518 on Reply Card

"A bent shaft on an elevator motor might have caused a terrible accident

. . . if Fusetron dual-element Fuses had not shut down the motor"

PAUL M. BULL, Commercial,
Industrial Representative
Idaho Power Co., Twin Falls, Idaho



Mr. Bull continues:

"As a Commercial and Industrial Representative for the Idaho Power Co., I was asked to redesign the electrical work for the Feed & Supply Center Inc., Twin Falls, Idaho. The installation was handled by Detweiler, an electrical contractor.

"When the job was completed, Fusetron fuses kept blowing on a 15 hp., motor that operates the elevator.

"Larger size Fusetron fuses were tried and the result was almost disastrous.

"When the motor started the whole elevator shaft shook as if it would tear apart. Everyone was afraid that at any second the motor and apparatus would come crashing down the shaft.

"Fortunately, the Fusetron fuses opened and stopped the motor.

"A thorough check revealed that the shaft of the motor was bent in transit.

"If Fusetron fuses had failed to open to protect the motor, there might have been a terrible accident."

You too, can benefit by the 10 point protection of Fusetron fuses.

Fusetron dual-element fuses offer the safest, most complete electrical protection possible. With rare exceptions on commercial and industrial installations — ordinary fuses and circuit breakers protect only against short-circuits — but Fusetron dual-element fuses provide 10 point protection.

Why Risk Losses! One burned out motor . . . one needless shutdown . . . one destroyed switch or panel . . . one burned out solenoid . . . may cost you far more than replacing every ordinary fuse with Fusetron dual-element fuses.

BUSS Hi-Cap Fuses—High Interrupting Capacity above 600 and up to 5000 amperes

BUSS Hi-Cap fuses offer unlimited interrupting capacity for circuits of 600 volts or less. Their high speed operation on heavy shorts limits current to safe values. This minimizes damage to equipment and cuts down dangerous stresses on transformers.

These fuses can be coordinated with Fusetron fuses to isolate fault to circuit of origin.

BUSS Limitron Fuses — Limits Fault Current to Very Low Values

BUSS Limitron fuses have extremely fast opening characteristics to prevent heavy short-circuit currents from building up under fault conditions.

For more information write for —

Bulletin FIS *on Fusetron dual-element fuses.*

Bulletin HCS *on BUSS Hi-Cap fuses.*

Bulletin HLS *on BUSS Limitron fuses.*

Bussmann Mfg. Div.
McGraw-Edison Co.
University at Jefferson,
St. Louis 7, Mo.

Play Safe! install FUSETRON dual-element FUSES and BUSS Hi-Cap FUSES throughout entire Electrical System!

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

78a

For more facts circle 519 on Reply Card

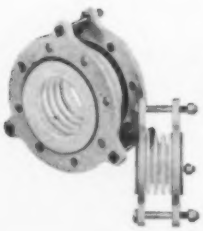
CHEMPRO
STYLE 20
TEFLON* -JACKETED
HEAD
GASKETS

Shipment from Stock

ALL SIZES
(Including 12" x 16" Elliptical Manhole Gaskets)

For All Makes of Glass-Lined Kettles, Mixers, Reactors, Heat Exchangers, Distillation Columns and Retorts.

also COMPLETE STOCK OF CORROSION-RESISTANT
CHEMPRO TEFLON
EXPANSION JOINTS



From 1"-6"
PIPE SIZES

*duPont Trademark

CHEMICAL & POWER PRODUCTS, Inc.
7 Broadway, New York 4, N. Y.

For more facts circle 520 on Reply Card

BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

Construction Briefs Go to School

PLANT ENGINEERING:

"I would be most interested in obtaining tear sheets of the Construction Briefs prepared by B. A. Wasil on pages 79-80 of the December, 1957, copy of PLANT ENGINEERING.

"It is the feeling of the faculty of this department that this information will be most helpful to our students in their Materials Testing Laboratory work.

"We find that the students have a deep interest in your publication and refer to it often, both for broadening their outlook and for reference purposes when submitting reports." *J. Edward Krauss, Professor and Head, Mechanical Technology Dept., New York City Community College, Brooklyn, N. Y.*

► It is gratifying to us to know that PLANT ENGINEERING is useful to students from whom industry will eventually draw its plant engineers. *Editors.*

Interested in AIPE

PLANT ENGINEERING:

"Your publication, PLANT ENGINEERING, has certainly been educational for me. Several times in the May issue, reference has been made to the American Institute of Plant Engineers. Is it possible to obtain more definite information on this organization? If so, I would certainly appreciate knowing where.

"Please continue the excellent coverage of the plant engineering field." *G. T. Musler, Plant Engineer, Instrument Development Laboratories, Inc., Attleboro, Mass.*

► Such words as Mr. Musler's are always appreciated. We are passing his letter along to the Assistant Secretary of the AIPE, Kay Buchanan, P. O. Box 185, Barrington, Ill., who will furnish complete information on that organization.—*Editors.*

The Old Question Again

PLANT ENGINEERING:

"We at Moore Business Forms are a multiple plant operation in the same city. Each plant is set up with a plant engineer, machine shop, electric shop, building maintenance and caretaking shops. This results in duplication of machine tool equipment and some personnel.

"At the present time we are considering the possibilities of consolidating these maintenance forces in a central group. I know that for years this problem has been discussed by management and plant engineers and that there have been many advantages and disadvantages on both sides.

"I would appreciate it if you could send me reprints of any articles you may have printed pro and con on this subject. The experiences of other companies will be very helpful in our discussions." *H. O. Loewer, Chief Engineer, Moore Business Forms, Inc., Niagara Falls, N. Y.*

► A good deal of information has been published in PLANT ENGINEERING on centralized versus decentralized maintenance and we have sent tear sheets of these articles to Mr. Loewer. Other plant engineers who have had this same problem might like to write to Mr. Loewer direct giving him their views.—*Editors.*

Solution to Lifting Problem

PLANT ENGINEERING:

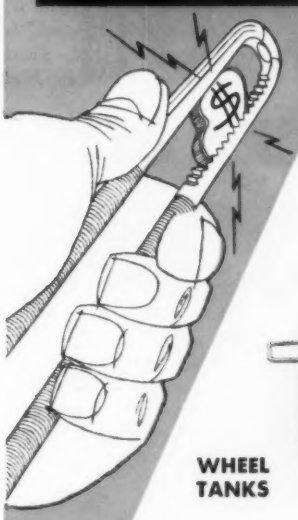
"Just read the article on sling failures which appeared in the April, 1958 issue of PLANT ENGINEERING. The propeller casting shown in the picture presents an interesting lifting and turning problem.

"Under failure case findings, the breaking strength of a 1½ in. by 6 by 37 plow steel rope, fiber core, is 76.4 tons. The splice efficiency of 80 per cent reduces this to 61.1 tons for the sling. Choker hitch efficiency of 75 per cent further reduces lifting capacity to 45.8 tons. This is breaking strength, *not safe working load.*

"As bends around sharp corners are shown, this further reduces capacity. When the load of 45 tons is thrown on one sling, failure is as certain as death and taxes.

"A single chocker sling made of 2

IT COSTS LESS... where liquids are HANDLED RIGHT



IT'S SAFER

to handle flammable and other dangerous liquids with approved Bowser equipment.

IT COSTS LESS

to avoid spillage and inaccurate measurement by using Bowser equipment.

WHEEL TANKS

Equipped with Protecto-Seal fill-vent with flame arrestor to assure safety with all liquids. Pump dispenses pint, quart, half or gallon quantities.

OIL OUTFITS

Several types of dispenser units are available with pumps that measure selected quantities accurately.

OIL FILTERS

Sizes from 1 to 100 sq. ft. filter area provide down to two-micron filtration for liquids to 450 SSU. Expendable cartridges are easily replaced. Smaller sizes mount on pipeline or floor stand.

REMOTE CONTROL VALVES

Gate valves with explosionproof switches. Simultaneously control flow and pump operation from remote points. Built-in lock and "dead-man" safety features.

OUTDOOR PUMP

Rugged, UL Approved hand pump for use on drums, tanks or underground storage. Equipped for padlock protection.

SAFETY PUMPS

Lift and dispense liquids from lower level tanks. Base bolts to floor.

HAND PUMPS

Pipeline, barrel, dispensing, refueling and skid-tank hand pumps. 10 to 20 g.p.m. Available in rotary or piston types in many models.

PRODUCTS OF BOWSER RESEARCH

YOU CAN BE SURE

. . . if your operations require liquid-handling in bulk or piped systems, there are many Bowser Products in addition to these shown to assure you maximum safety and operating economy.

BOWSER

NATIONWIDE SALES AND SERVICE

THERE IS A BOWSER MAN NEARBY TO SERVE YOU

Regional Offices:
ATLANTA • BOSTON • CHICAGO • CLEVELAND • DALLAS
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and Representatives in Principal Cities

BOWSER, Inc.
Fort Wayne, Indiana

DATE_____

☐ Please send data and prices.

COMPANY_____

NAME_____

ADDRESS_____

CITY_____ STATE_____

For more facts circle 521 on Reply Card

Locate Leaks The Easy Way

With General Electric's new and complete line of leak detectors

G.E.'s versatile, Type H halogen leak detectors locate leaks quickly and accurately in any system or component under pressure or vacuum. They are easier to use and much more sensitive than ordinary methods of leak detection.

(A) Standard control unit is used with any one of the following detectors: (B) gun detector, (C) stationary detector, (D) vacuum detector, (E) pencil-probe detector.

For more information write for Leak Detector Bulletin GEA-6817. Section 585-67, General Electric Company, Schenectady, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 522 on Reply Card

BACKTALK— FORETHOUGHTS

in. by 6 by 37 improved plow steel rope, used in a basket hitch will pick up this load with a safety factor of 5. Should you desire to rotate the load and protect the sling at the same time, it is essential to rotate the sling with the load. This avoids a local scrubbing action caused by the sling slipping on the propeller.

"To accomplish this, the crane hook is fitted with a sheave or tackle block, the sling is threaded through the sheave and the hub of the propeller. Both loop ends of the sling are then connected, forming an endless grommet. Protector arcs should be placed at sharp corners. You are now ready to lift.

"There is no possibility of one sling being idle as you have automatic equalization on both sides of the sling. No other sling is necessary unless the load would have a tendency to roll over too fast at some point during the operation. If this should prove to be the case, the auxiliary hoist hook can be rigged to control the speed of the turning operation, in which case an additional but smaller sling will be required.

"Your unknown author may be interested in this solution to his problem.

"The safe load ratings of any sling is dependent on the type of hitch and the angle at which it is used. Sling load ratings for various types of hitches and sling angles are given in most sling catalogs." *F. W. von Wehrden, Broderick & Bascom Rope Co., St. Louis, Mo.*

▶ Picture shows how slings were applied to the propeller before the accident reported in the article "Stop Sling Failures," referred to by Mr. von Wehrden. We are grateful to him for his suggested solution to the problem.—*Editors.*

Water Conservation Article Wanted

PLANT ENGINEERING:

"The article on page 90 of the February, 1958, edition of PLANT ENGINEERING is of interest to the writer. The title of the article is 'Water Is To Save — Ideas that Conserve Dollars, Too, at G. E.'

"The writer is to address water treatment plant operators at a short course to be held at the University of Illinois under the supervision of the Department of Public Health, Division of Sanitary Engineering, State of Illinois, Springfield. The assigned topic is 'Operation and Maintenance of Water Works Pumping Equipment,' and since water management people are among those to be present, this particular article appears of timely interest.

"Therefore, if you could spare six tear sheets of the article it would be sincerely appreciated." *C. A. Scott, Vice President, The American Well Works, Aurora, Ill.*

▶ Mr. Scott's request for tear sheets of this article has been filled. There are still copies available for readers interested in the subject of water conservation.—*Editors.*

Articles on Casting Repairs

PLANT ENGINEERING:

"We are interested in securing about three copies of an article which appeared in the September, 1957 issue of PLANT ENGINEERING.

"The article was written by R. L. Rectenwald, Maintenance Engineering Corp., Pittsburgh, Pa., and referred to a type of cold metal stitching or Mecostitch. I believe this particular article was one of three installments.

"If it is necessary to send the entire magazine, and there is a charge, please bill our Purchasing Department and payment for same will be forwarded." *A. E. Osbaugh, Masonite Corporation, Ukiah, California.*

▶ The article in question "Cold Metal Machine Repair—Casting Fractures Are Stitched With Alloy Bars," was the second part of a three-part article. This, along with Parts I and III have been sent to Mr. Osbaugh.—*Editors.*

Condensation Problem

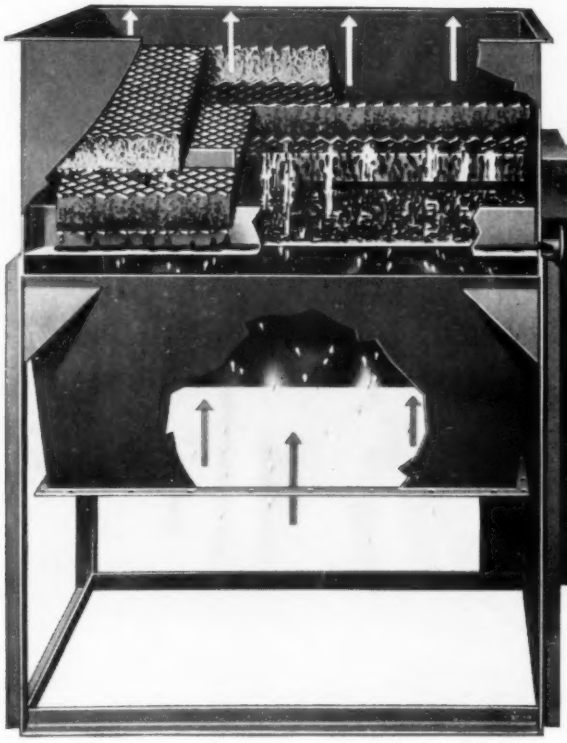
PLANT ENGINEERING:

"We have several storage tanks ranging from 10,000-gal capacity to 23,000-gal capacity. These tanks are above ground level and we have noticed upon several occasions that condensation is extremely bad in these tanks. They are used for the storage of alkyd resins and solvents.

"We would appreciate you advising us as to who could give us some information as to how this situation could be corrected. We are very anxious for this information and would appreciate it as soon as possible." *J. O. Roberts, Jr., Purchasing Agent, Carolina Paint & Varnish Co., Greensboro, North Carolina.*

▶ With so little information to go on, we can only suggest the obvious remedies of insulation, keeping the tanks full, or drying the air coming into the tanks. If any reader can offer Mr. Roberts any further suggestions, we are sure he would be glad to hear of them.—*Editors.*

NOW! COLLECT MISTS AND VAPORS ECONOMICALLY with the...



AAF TYPE M CYCOIL

Plating tanks and similar industrial operations need no longer be a maintenance headache or contributor to atmospheric pollution. AAF's new Type M CYCOIL is higher in efficiency, lighter in weight, lower in cost and requires less space than conventional wet collectors used for this service.

Fluid bed pad provides multitudes of flooded contact surfaces for highly effective scrubbing of exhaust air or gas. No liquid retention, no recirculating pumps, no heavy scrubbing or eliminator section required. Normal water supply is three quarts per hour for each 1000 cfm.

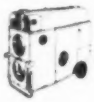
The Type M Cycoil is available in seven sizes ranging from 1,200 to 24,500 cfm. Exhaust fan and matching supports can also be provided. For more information, write for Type M CYCOIL Bulletin 286. Address: Mr. Robert Moore, American Air Filter Co., Inc., 228 Central Avenue, Louisville, Ky.

AAF herman nelson

American Air Filter
COMPANY, INC.
228 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

Air Filters and Precipitators Illinois Heating Specialties

BETTER AIR IS OUR BUSINESS

Herman Nelson Unit Heaters  Herman Nelson Portable Heaters

For more facts circle 523 on Reply Card

For more facts circle 524 on Reply Card →

Correct Lubrication in Action...

How Mobil Saved

This dramatic operation shows parts of TV tube being joined on Electric Sealing Lathe. Edges of tube parts are softened by gas flame, then sealed by high-frequency electric current when glass becomes hot enough to conduct electricity.

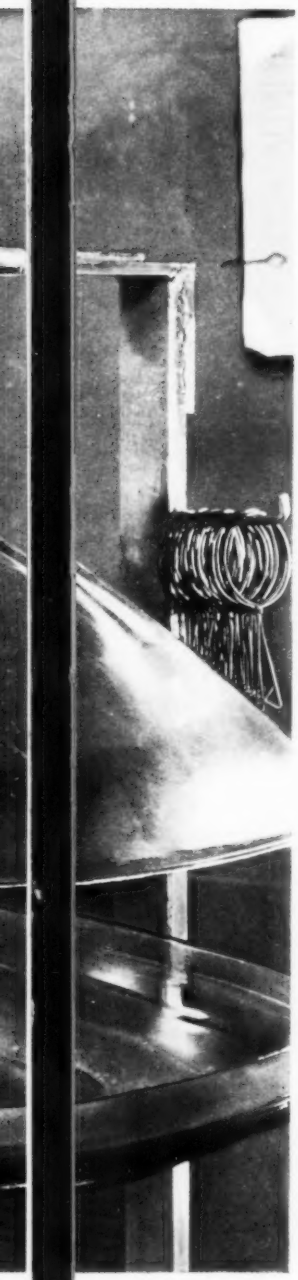
Mobil

Complete Engineering Program
Proved Petroleum Products

Mobil

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

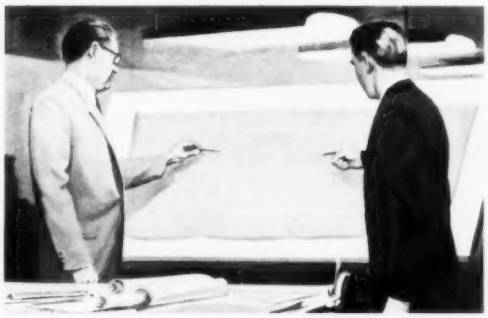
Corning Glass $14,880



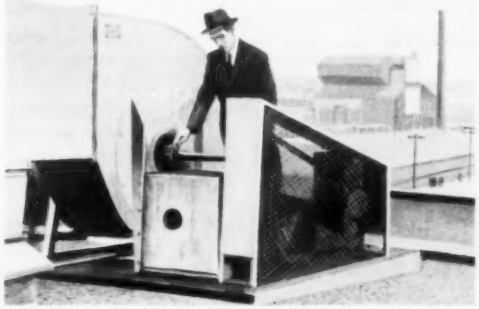
Since making the bulb for Edison's lamp, Corning Glass Works has continually pioneered in the development of new types of glass. At the same time Corning has developed intricate machines and manufacturing methods that enable it to produce the most precise glass items at production line pace.

Mobil has worked with this company for many years. It has met the challenge of demanding and often unique lubrication requirements with products and service so effective that they have resulted in constant and significant savings. Corning's records show that, in 1957 alone, savings made through Mobil Correct Lubrication amount to over $14,000.

Some of these savings are briefly documented below. All of them are the result of Mobil working hand-in-hand with Corning personnel . . . training them in maintenance methods . . . studying production problems, making lubrication studies . . . using Mobil research and laboratory facilities to cut costs, keep pace with Corning's needs. Why not find out how Mobil *Correct Lubrication* can reduce maintenance costs, increase profits in *your* plant?

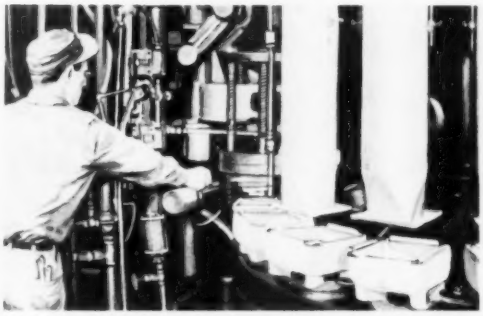


Lubrication study increases maintenance efficiency—Mobil engineers working with maintenance supervisors made complete study of machine lubrication requirements and application . . . even blueprinted oiler routes down to last detail . . . saved maximum time and money for Corning.



Outdoor bearing replacement eliminated—Air circulating system power units located on plant roof are subjected to abnormal corrosion and temperature extremes. Mobil maintenance recommendation cut servicing time by 300 hours . . . eliminated bearing replacements . . . saved $920 a year.

$2,785 saved on lift-truck maintenance—Prior to Mobil recommendation, Corning's gasoline-powered lift-trucks were overhauled every 4 months. Use of *Mobiloil Special* lengthened overhaul period to 12 months, cut oil consumption in half, reduced maintenance time by 144 hours a year.

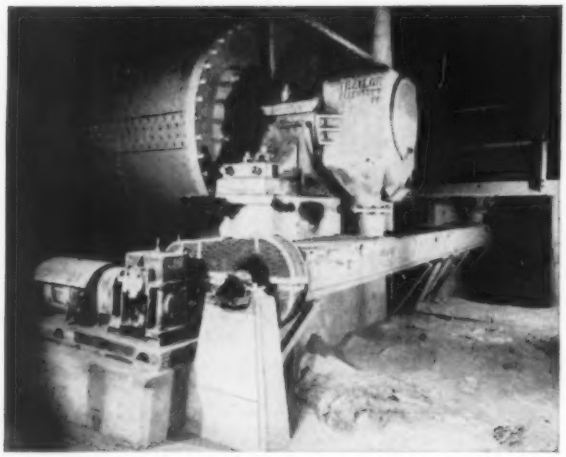


Shear spray lubricant saves $11,175—In automatic glass-forming machines, steel shears that cut molten glass were pitting, rusting, leaving excessive "shear" marks on molded material. Mobil introduced product, about 1/10 cost of previous lubricant, to cut reject rate, reduce maintenance and parts replacement.

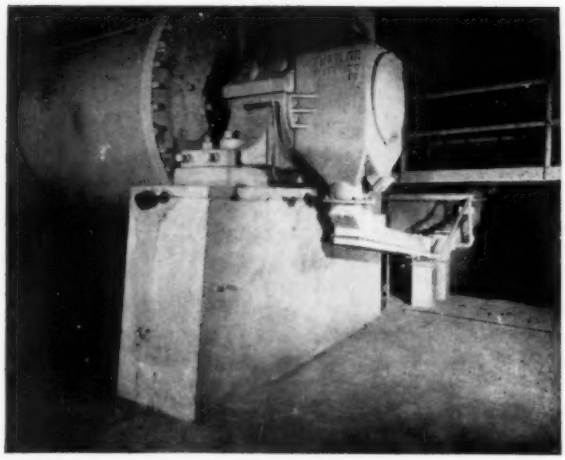
Correct Lubrication

Another reason You're Miles Ahead with Mobil!

The Arithmetic of Materials Handling



BEFORE: **Dirt, noise and mechanical breakdown** were constant problems in this cement plant, where two mechanical conveyors were used to collect raw materials. A 5 h.p. motor driving auxiliary equipment wasted valuable space and power, required frequent maintenance. Spillage clean-up wasted costly man-hours.



AFTER: **Clean, simple, quiet.** Notice the difference two 8" F-H Airslide® fluidizing conveyors have made. No dangerous moving parts. Nothing to lubricate. Auxiliary equipment and foundations are gone. Power needs are now only ⅛ of previous needs. Fluidizing saves wear and maintenance.

AIRSLIDE® Fluidizing Conveyor

minimizes material loss . . . maintenance . . . moving parts

If you are now handling dry, pulverized materials, the F-H Airslide Fluidizing Conveyor can help you stop noise, and air-pollution, as well as speed flow and reduce maintenance cost.

Simplicity Itself

F-H Airslides fluidize dry, pulverized materials with low pressure air.

These materials literally flow at high speed, down the inclined conveyor. Power requirements are small.

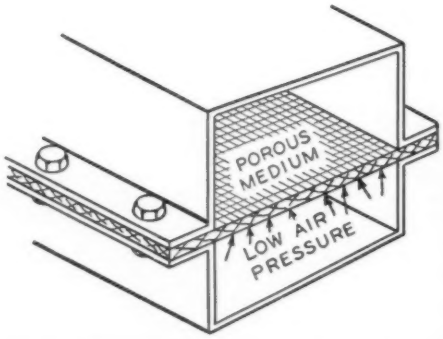
Flexibility, Low Cost

For unlimited applications, Airslide conveyors take up little space, and can be used singly and in combination with other Fuller pneumatic conveying systems. The movement of fluidized material can be around corners, between floors, through walls—nearly any conveying distance.

Better Housekeeping

Can Fuller conveying systems help eliminate your housekeeping problems—cut your maintenance and handling costs? Write today, outlining your problem in handling dry, finely-divided materials. Fuller will gladly make appropriate recommendations.

"Pulverized Materials Flow Like Water!"



AIRSLIDE PRINCIPLE: Porous supporting medium divides conveyor section into two "compartments". Dry material flows down inclined conveyor, fluidized by low-pressure air entering beneath porous medium.

FULLER COMPANY GENERAL AMERICAN TRADE MARK

Fuller ....pioneers in harnessing AIR

FULLER COMPANY
138 Bridge St., Catasauqua, Pa.
SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION
Birmingham • Chicago • Kansas City • Los Angeles • San Francisco • Seattle

4483
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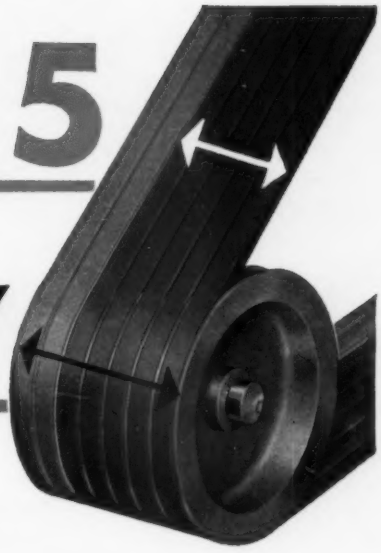
"See Chemical Engineering Catalog for details and specifications".

For more facts circle 525 on Reply Card

Drive with 5 instead of 7



Use fewer V-belts... get equal horsepower
Save space and costs

You cut sheave width and weight . . . you save in overall costs . . . by using Gates Super Vulco Ropes with 40% more HP capacity. Five Supers actually do the work of 7 standard V-belts.

For that reason, a Super Vulco Rope Drive delivers more HP per dollar invested than **any** standard V-belt drive.

Sheaves with fewer grooves cost less . . . weigh less . . . occupy less space. Your drive design is greatly improved.

You can get helpful drive data quickly. Just call your nearby Gates distributor for advice from a Gates V-Belt Specialist.

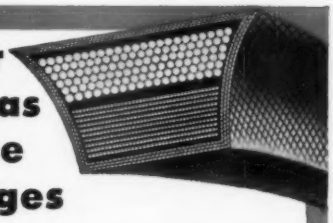
Stocks carried in industrial centers throughout the world.

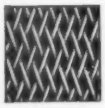
Gates Distributors are in the Yellow Pages

The Gates Rubber Company
Denver, Colorado
World's Largest Maker of V-Belts

Gates — The Mark of *Specialized* Research

No other V-Belt has ALL these advantages





1. Flex-Weave Cover (U.S. Pat. 2519590)
A Gates exclusive: provides greater flexibility with far less stress on fabric. Cover wears longer... increases belt life...more power available to driven machine.

2. Concave Sidewalls (U.S. Pat. 1813698)
Concave sides (Fig. 1) increase belt life. As belt bends, concave sidewalls become straight, making uniform contact with sheave groove (Fig. 1A). Uniform contact means less wear on sides of belt... far longer belt life.

3. Tough, resilient Tensile Cords
Super-strong resilient tensile cords provide 40% greater horsepower capacity ...easily absorb heavy shock loads... reduce number of belts required... save weight and space.

4. High Electrical Conductivity
Built into Gates Super Vulco Ropes for safer drives (in explosive atmospheres).

5. Oil, Heat, Weather Resistant
Special rubber compounds make Super Vulco Ropes highly resistant to heat, oil, and prolonged exposure to weather.

TPA 306

Gates Super Vulco Rope Drives
40% more Horsepower Capacity

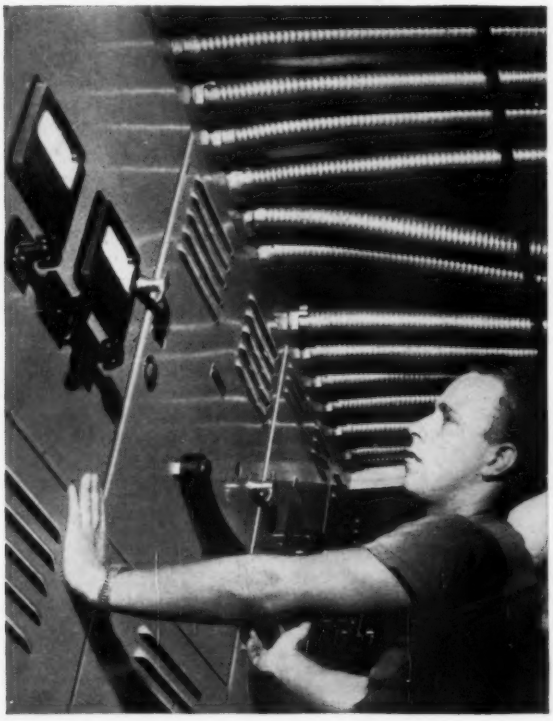
For more facts circle 526 on Reply Card

This picture shows why . . .

Anaconda's Duralox Cable cuts installation costs up to 50%

Duralox needs no conduit— saves time, money, manpower.

Duralox* is already enclosed in durable, yet flexible, metal armor. Thus, it can be installed *without* conduit—in long runs over and around obstructions, in trays, indoors or out.



THE FLEXIBILITY of Duralox Cable enables neat, efficient installation and facilitates equipment and terminal connections.

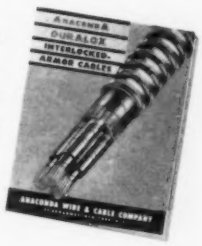
FITTING NEATLY AROUND BEAMS, Anaconda Duralox Cable installed in large industrial plant. Cable is 600 volt, 500 Mcm, varnished-cloth insulation.

Duralox is easily moved and is 100% salvageable — makes your entire plant operation more flexible.

And Duralox's lower reactance in higher voltages — because of the close spacing of conductors — results in reduced voltage drop and more efficient power distribution. Available in all popular sizes and voltages. Whether you're wiring a new plant or rewiring an old one—see the Man from Anaconda. Duralox is just one of the many types of Anaconda wire and cable that can help you increase plant flexibility . . . cut operating costs . . . get new power fast. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U. S. Pat. Off. 5830?G.I.

BULLETIN DM5606 on Anaconda Duralox Cable is yours for the asking. Write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.



LIVE BETTER ELECTRICALLY

SEE THE MAN FROM

ANACONDA®

FOR **DURALOX POWER CABLE**

For more facts circle 527 on Reply Card

PLANT ENGINEERS' DIGEST —so those who rush may read and know what's new

Edited by Marjorie E. Weissman

Reclaim Water and Chemicals

RECLAMATION OF STEAM ordinarily exhausted from a powerhouse will, it is estimated, save the Columbus, Ohio division of North American Aviation, Inc., $23,600 annually.

A dry-type, fluid cooler was installed on the roof of the powerhouse for reclaiming the water and chemicals.

Biggest problem in designing the system was that of control because of the variables involved. Exhaust steam was both produced, and partially consumed for heating, at varying rates. Condensing capacity and temperature varied with the outside temperature and the need for protection against freezing added to the problem.

The control sequence consisted of the following: Steam is introduced at the condenser header through a modulating steam valve. The resultant header pressure is sensed by a controller which proportions the shaft angle of a modulating electric motor. This motor drives an auxiliary potentiometer and a double mercury switch. The potentiometer modulates the action of eight reversible motors, operating dampers over the condenser sections.

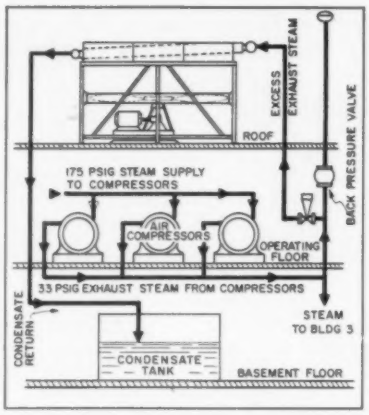


Diagram of installation which condenses steam exhausted by steam driven air compressors. Saving is $23,000 annually

At the center of the stroke of the first motor, the dampers are completely open. This motor continues to rotate on further pressure increase. The last 10 per cent of the stroke closes a contact in the mercury switch, which causes a modulating reversible motor to drive a four-piston step switch controlling the fan motor starting circuit. Continued rotation of the step switch occasioned by rising pressure will increase fan speed.

(Continued on page 42)

Electromechanical Control System Checks Downtime, Monitors Production

AN ELECTROMECHANICAL system developed and used by the Hancock Manufacturing Co., Jackson, Mich., not only monitors and controls the production of automobile parts, but shows immediately when an emergency occurs in the production process.

Each production machine is linked electrically to a central production monitor room where up-to-date production data is provided in visual form on a control panel.

A control box provides each machine operator with a means of signalling the dispatch room. The box has two lights, a switch, a reset button, a lock and telephone jack. Both lights are duplicated on each of the 20 display panels of the control cabinet.

Foreman, signalled to machine can telephone for more parts, or maintenance man

During normal production, a green light shows, but when an operator needs assistance from his foreman, he pushes an alarm switch which causes a red light to flash in the dispatch room. Simultaneously, an audible 'beep' warns the dispatcher to direct the foreman by public address system to the machine requiring the assistance.

Should the trouble be mechanical and require repair, the foreman can request the dispatcher by telephone that a maintenance man be sent to the machine. If the repair is a time consuming one, the machine operator can be transferred to another machine. If the operator needs more parts or material for his machine, these too can be requested through the dispatcher. In the past year, this system has reduced downtime at the plant by more than 50 per cent. *From a release of Control Systems Co., Div. Hancock Industries, Inc., Jackson, Mich.*

NEVER OVERLOOK THE DANGER OF EXPLOSIVE DUST...

Some of the most disastrous explosions in industrial history occurred through the ignition of dust suspended in plant atmosphere—some of them dusts which were thought to be perfectly harmless. *Until they exploded.*

The moral is clear: If you can see quantities of dust in your plant, *it's dangerous.*

Crouse-Hinds dust-tight* Condulet equipment seals off electrical sparks and prevents ignition of air-suspended dusts. It is designed to minimize the accumulation of dust on outer surfaces. As an added precaution, it is built to operate at a temperature below dust-ignition points *even when blanketed with dust.*

The new Crouse-Hinds "Hazard Finder" will help locate the hidden probabilities of electrically-ignited explosions in your plant. It reflects, in non-technical language, the latest findings of the National Fire Prevention Association for thorough control of electrical explosion hazards. Just clip coupon below.

*Dust-ignition-proof.

Crouse-Hinds Dust-tight Lighting Fixture

Crouse-Hinds Dust-tight Panelboard

● CONDULET® ELECTRICAL EQUIPMENT — More than 15,000 items in dust-tight, explosion-proof or conventional construction . . . including rigid conduit fittings, lighting fixtures, switches, plugs and receptacles, motor controls, pilot lights, push-button stations, and other process control components.

CROUSE-HINDS COMPANY
SYRACUSE 1, N. Y.

Crouse-Hinds products are sold exclusively through electrical distributors.

Send coupon today for handy new HAZARD FINDER!

Contains 13 check questions to which every management team should know the answers! Each answer evaluated in accordance with National Electrical Code requirements.

CROUSE-HINDS COMPANY
1205 Wolf St., Syracuse 1, N. Y.

Send me your Hazard Finder.

Name_____
Position_____
Company_____
City_____
Zone_____ State_____

For more facts circle 528 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

On decreasing condensing requirements, this action is reversed.

The damper over the sub-cooling coil is controlled by the temperature of the leaving condensate. If this temperature drops below approximately 40 F, a thermostat will interrupt fan and damper circuits, stopping the fan motor and closing all dampers.

Five thermostats along the length of each of the condensing and sub-cooling coils will open the fan and damper circuits if the coils should approach freezing temperature. *From Weather Magic, published by The Trane Co., La Crosse, Wis.*

Plywood Roof

THICK PANELS of pressure-treated fir plywood have been used to solve a roofing problem at the Fibreboard Paper Products Corp., plant at Stockton, Calif.

The plywood used for the job was

Pressure-treated plywood panels form roof over paper-making-operation. Hatch is cut to allow installation of fans

2.4.1 with an exterior-type glue line for maximum resistance to the high temperatures and humidity resulting from the paper making process.

Work began with the installation of steel beams, tapered from eight to 20 in. on stub columns bolted through parapet walls. Beams were spaced on 15 ft 6 in. centers. The taper gave the roof a pitch of ½ in. to the foot. Engineers had to cope with the structural problem of lateral bracing, yet make the plan conform with standard sheathing panels.

As a compromise technique for spanning the bays, plywood panels were sized to 4 ft by 7 ft 9 in. and laid over purlins ranging in dimension from 4 in. by 8 in. to 4 in. by 10 in. Between purlins, butting ends of the plywood panels were joined with full-joint, 2.4.1 six-in. cleats secured by 16-gage, two-inch screws, power driven.

Work on the underside of the roof, which covers nearly 12,000 sq ft, was facilitated by the construction of a plywood scaffolding resting four feet below roof level on two existing overhead cranes. This platform aided the installation of new overhead lighting, ventilation and sprinkler systems.

Roofing over the plywood consists of a water barrier of two layers of 15-lb hot-mopped glazed felt, insulation and built-up roof. *From a release of Douglas Fir Plywood Association, Tacoma, Wash.*

Keeping Reservoir Clean

WHEN A COOLING tower was installed at the West Allis works of Allis-Chalmers Manufacturing Co., a five-million gallon spray pond was converted into a reservoir. A prob-

(Continued on page 44)

Air-Operated Painting System Paints Parts Uniformly and Quickly

PAINTING THE EDGE of plastic speedometer dials uniformly and as rapidly as possible is done by using an air-operated paint fixture that clamps, masks, spins, sprays and releases the work-piece in four seconds, at Birmingham Plastics Inc., of Birmingham, Mich.

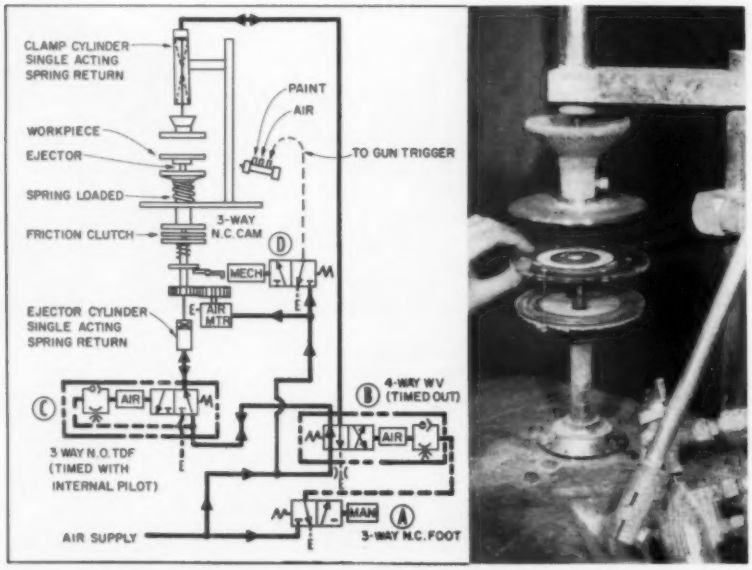
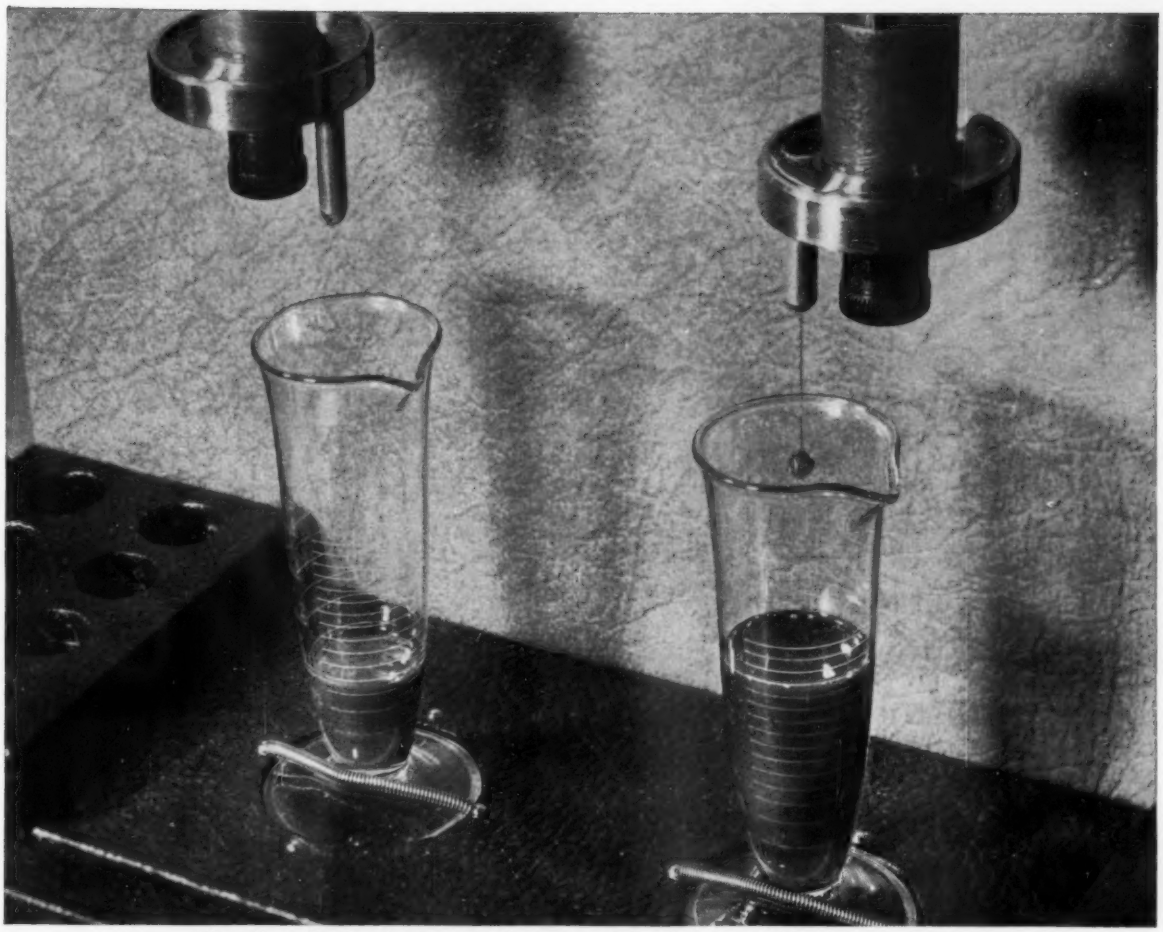


Diagram shows how air operates system. Right, piece is lifted for clean removal

As a result, production of the piece has been raised more than 30 per cent.

The presence of explosive paint fumes ruled out electrical operation, so an air motor is used to turn the spindle. A rotating air cylinder clamps and masks the piece and air is used to activate the one-second paint spray. On completion of the spraying, a rotating air cylinder lifts the piece so that it may be removed without smearing the paint.

A four-way valve is used to operate two single-acting cylinders in the circuit. The standard function of such a valve is to operate a double-acting cylinder, but since the clamping cylinder and ejection cylinder operate within a short time of each other, the one valve has been used to actuate both spring and returned cylinders. *From Ross EnginAir, published by Ross Operating Valve Co., Detroit, Mich.*



The oils collecting in these graduates are being forced, at 100 psi, through two sintered bronze bearings. Although each oil has the same viscosity, the Suntac on the left is leaking *only one quarter as much as* the straight oil on the right.

Desk-top demonstration proves that SUNTAC HYDRAULIC OILS can cut your oil losses . . . up to 75%

Suntac® oils are competitive in price, competitive in quality, *and unique in their ability to reduce oil leakage without costly shutdowns.*

Suntac oils are high-quality, exceptionally stable mineral oils especially compounded to reduce leakage. Experience proves that they give longer pump and seal life with higher overall operating efficiency.

See for yourself how a Suntac oil can cut your oil costs. A simple desk-top demonstration will show you how.

Ask your Sun man to show you how others have reduced oil consumption, or write to Dept. PY-7.

Industrial Products Department

SUN OIL COMPANY, Phila. 3, Pa.

SUNOCO®

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In Canada: Sun Oil Company Limited, Toronto and Montreal

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Designed with the Look of Tomorrow by Raymond Loewy Associates

NEW PARTLOW MFS TEMPERATURE CONTROL

New Looks, Convenience, Efficiency for Your Process Equipment

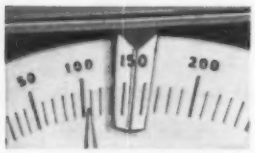
Striking as they are, good looks are only part of the story of Partlow's spectacular new control. Inside and out, the MFS is as rugged and efficient as a temperature control can be, its tough mercury-actuated element having been built to retain sensitivity and accuracy even under extreme conditions. Convenient, too! You can interchange the mercury element right out in the field . . . no factory adjustment is required.

The MFS comes in 10 scale ranges. Accurate within ½ of 1% of scale range, it is especially adaptable to control applications where temperature variations must be kept at a minimum; or where sudden temperature changes demand instant response.

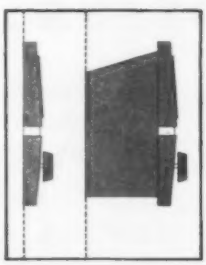
If your product or process requires close, positive temperature control within the –30° F. to 1100° F. range, you are invited to test this advanced new instrument soon. Write, wire or phone today.

THE PARTLOW CORP.
DEPT. PE-758, NEW HARTFORD, N.Y.

Only in the Partlow MFS so many important innovations:



Accu-Vision Dial — Magnified pointer for closest settings. Dial calibrations, pointers and background scientifically color-contrasted for easy readability — even at a distance.



Flush or Wall Mounting — No additional brackets or hardware are required. Case is grey reinforced plastic —tough, lightweight, easy to clean, won't crack under extreme temperatures.

LOOK TO PARTLOW FOR:
Recording Controls — Indicating Controls
Non-indicating Electrical Controls
Non-indicating Mechanical Controls — Timers
Recording and Indicating Thermometers
Limit Controls — Combustion Safeguards

PARTLOW

For more facts circle 530 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

Metal retaining walls keep reservoir free of soil eroding from slope above it

lem arose when dirt eroded from the banks and entered the water. Railroad tracks atop the turfed slope bordering one side of the reservoir made it impractical to lower the grade and thereby eliminate soil erosion. Instead, metal bin-type retaining walls were installed at two corners. One wall is 50 ft long, the other 30 ft long. Both are 8 ft high. *From a release of Armco Drainage & Metal Products, Inc., Middletown, Ohio.*

Increase Belt Life

OUR ENGINEERING department has investigated the relationship which exists between tension, temperature and service life of belts used in metal treating furnaces.

A belt was made with seven equal sections each of a different alloy. It was used in three different furnaces under operating conditions. Belt design, furnace temperature, belt speeds and atmosphere were identical. Results of the tests were matched against data obtained from 72 of our installations in copper brazing furnaces.

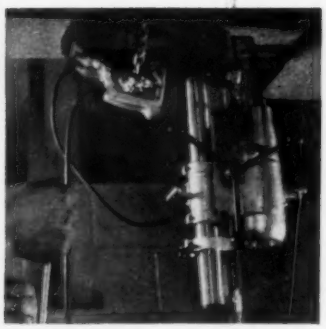
Conclusions reached were: 1. Reducing belt tension increases the service life of the belt. To minimize tension it is imperative that the drive be at the charge end.

2. With all other conditions constant, service life of the belt is in-

For more facts circle 531 on Reply Card ⟶

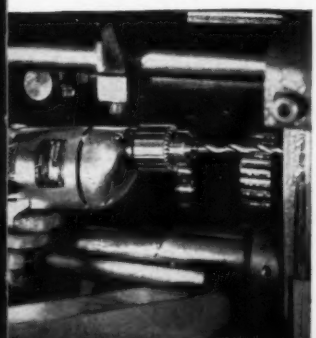
There's a Black & Decker Drill powered for every job!

LITTLE SHORTY's the drill you want for those hard-to-get-to, around-corner jobs. Gets in tight spots! Excellent for small unit assembly.



DRILLS UPSIDE DOWN! B&D Magnetic Drill Press sticks to the wall like a fly; operates manually or with exclusive remote control.

TREMENDOUS TORQUE for the tough jobs. ⅜" H.D. Holgun® is geared and powered to take on the hard ones. Compact to work in close quarters.



MOST POWERFUL drill of its size available, the ¾" Standard! A rugged tool with plenty of zip in reserve. Fully reversible; positive drive chuck.

71% of purchasing agents say make mine Black & Decker!

A recent industrial publishing company survey reveals that when purchasing agents need electric tools most think first of Black & Decker! One reason why: 33 *different* drills each designed to give you the power you need *plus* easy handling and long, troublefree life!

If you have a drill problem—a small hole in trim to a large hole up among the structural steel—be sure to see Black & Decker. Better still, mail the coupon for a free demonstration of our drill line. THE BLACK & DECKER MFG. CO., Dept. 0807, Towson 4, Maryland. (In Canada: Brockville, Ontario).

Leading Distributors Everywhere Sell

Look Under "TOOLS-ELECTRIC" in Yellow Pages

Black & Decker®

Quality Electric Tools . . . Power-built for top performance

MAIL COUPON FOR FREE DEMONSTRATION

THE BLACK & DECKER MFG. CO., Dept. 0807, Towson 4, Md.

☐ Please arrange for a demonstration of the following drill(s) .....

☐ Please send me additional information.

Name ..... Title .....

Company .....

Address .....

City ..... Zone ..... State .....

Preferred by most plant engineers for supplementary air power, Schramm Portable Compressors with Pneumastat Control produce compressed air to the exact requirements of tools being used. They operate at any desired pressure for long periods without maintenance.

SCHRAMM PORTABLE COMPRESSORS PROVIDE . . .

Stand-by air power

Schramm Portable Air Compressors offer valuable insurance for any industrial air system. When emergencies occur, supplementary air can be towed right to the spot to put you back in operation. Lost time is practically eliminated and capital investment is kept to a minimum.

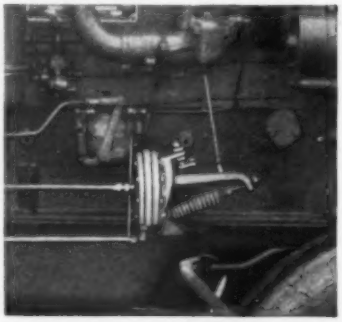
Portable compressors don't stand idle when waiting for trouble . . . there are 101 other jobs for portable air around the plant. Maintenance jobs—inside the plant and out—constantly demand air, as well as air-powered jobs in temporary locations. And when deciding upon the right amount of air for a new job, try using portable compressors—you'll like their flexibility.

You'll also find Schramm Compressors lower in cost than most portables and more economical to run. Schramm engines operate at a conservative rating for long life, instead of being overspeeded to 1800 or 2100 rpm. *Result:* economical operation over long periods without maintenance.

Full details of Schramm Portable Compressors ranging from 125 to 600 cfm—most often used for plant operation—are yours for the asking. Write for Catalog SPB-58 or see your local Schramm Dealer.

See the Yellow Pages for local Sales, Service and Rental of Schramm Air Compressors.

A self-propelled source of air power is the Schramm Heavy Pneumatractor. Drives to the job . . . is ideal for maintenance work. Has tractor features *plus* 125 cfm of air.



The Schramm Pneumastat, watchdog of your compressor, is an exclusive patented air-delivery regulator. It assures full rated capacity at all times. Saves up to 50% in fuel costs.

Schramm, Inc.

MANUFACTURERS OF AIR COMPRESSORS

665 North Garfield Ave. • West Chester, Pa.

For more facts circle 532 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

creased when the speed of the belt through the heat zone is increased. The combination of temperature and furnace atmosphere affects the belt in such a way as to suggest that the belt be moved through the furnace as quickly as possible.

3. The concave or convex camber developed by belts used in copper brazing furnaces must be minimized. This can be accomplished by periodically removing the belt from the furnace and running it in the opposite direction to that in which the camber was produced. Belts should not be reversed after they become rigid and embrittled from long service. *From The Cambridge Wire, published by The Cambridge Wire Cloth Co., Cambridge, Md.*

All in the Same Trough

Lighting circuits and power cables for machine tools and test equipment are carried underground in overhead channels at research center. (From a release of Boeing Airplane Co., Seattle, Wash.)

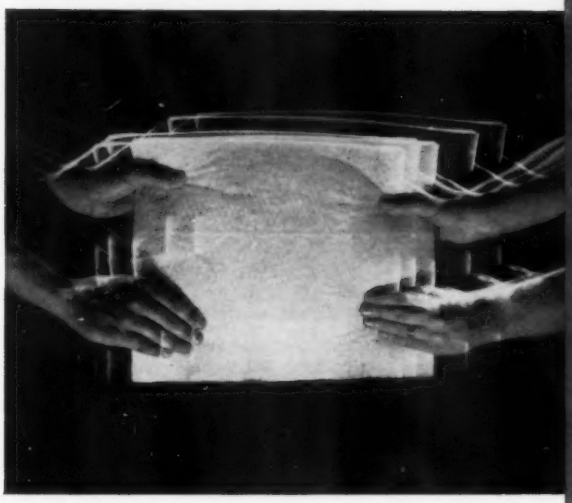
Magnetic Presses

THREE DAYS' PRODUCTION time was saved at the Norton Company's grinding machine division by using magnetic drill presses to solve a production drilling problem.

The job consisted of a weldment 10 ft wide, 24 ft long and weighing about 25,000 lb, in which 384 holes had to be drilled. Diameter of the holes ranged from ½ in. to 1 in.

The original plan was to lift the

Try these 3 tests with Pittsburgh Superfine Fiber Glass Insulation



PULL IT—see how strong Pittsburgh Superfine is! It's built to last wherever you install it. It retains this same strength indefinitely. Won't disintegrate or rot with age.

PRESS IT—and see how it returns to its original shape. You can compress Pittsburgh Superfine for long periods of time, yet it will always spring back to its former shape!

GIVE IT A BEATING—and see how Pittsburgh Superfine absorbs the shock, and comes back. Pittsburgh Superfine loves rough handling.

PITTSBURGH SUPERFINE FIBER GLASS is great for insulating against heat or cold or noise. It's lightweight, cuts easily to correct size . . . is rot-proof, fire-resistant . . . handles easily, avoids skin irritation . . . saves installation time. Try it!

For complete information on Pittsburgh Superfine, call your nearest PPG Sales Office, or write to *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Penna.*

PITTSBURGH SUPERFINE INSULATION IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, Minneapolis, New York, Philadelphia, Pittsburgh and St Louis

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SYMBOL OF SERVICE FOR SEVENTY-FIVE YEARS

PITTSBURGH PLATE GLASS COMPANY

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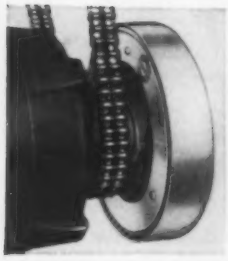
OFF-THE-SHELF

SERVICE WHEN YOU NEED IT...



Heard About Whitney-Tormag Magnetic Drives? *For complete motor overload protection, cushioned starts and high efficiency, ask about our new permanent magnet, self-contained power tranfer unit. Available in 1 and 2 H.P. units as stock items, additional sizes up to 15 H.P. will follow.*
Write for literature.

Whitney, the *complete* line of finished steel chain, attachments and sprockets meets every industrial demand. Packaged for convenience, sure stock identification, easy, clean handling . . . exclusive plastic packaging of disassembled parts permits ready selection, quick, easy chain assembly.

Depend on your nearby Whitney distributor for all drive replacements and technical assistance. Your profitable production is Whitney's foremost project!

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ROLLER CHAIN • CONVEYOR CHAIN • SPROCKETS • FLEXIBLE COUPLINGS • WHITNEY-TORMAG DRIVE

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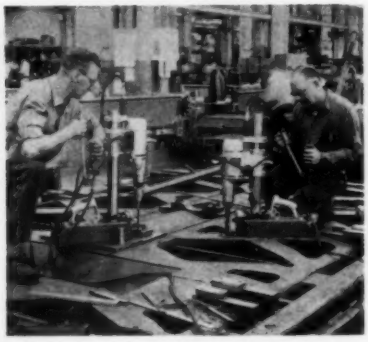
PLANT ENGINEERS' DIGEST

(Digest begins on page 40)



Magnetic presses are used to drill heavy weldment. Job would normally have been done in stationary radial drill

assembly by overhead cranes and maneuver it under a large radial drill. Six separate placements would have been necessary to reach all the holes, with a setup time of four to six hours for each placement.

Before this maneuver was attempted, the use of a magnetic drill press was suggested for the job, and two of the portable units were obtained. The units were easily moved to each hole location providing an accurate, stationary drill press.

The magnetic base of the press is controlled by a trigger switch. To secure it to the metal work surface, the switch is released. A special drill point locator makes it possible to align the unit so that holes can be drilled to a 1/64-in. accuracy.

The time required to drill the 384 holes with the two magnetic drill presses was considerably less than positioning time required by previous method. *From a release of Black & Decker Mfg. Co., Towson, Md.*

Effects of Radiation on Materials

ALL MATERIALS react to the effects of gamma rays and neutrons. Gamma rays interact with the electrons in the materials they encounter, producing "energetic" electrons which ionize the regions they traverse. Neutrons react principally with the nuclei of atoms, causing intense ionization.

Metals, in general are affected only by "fast" neutrons causing changes in the crystal structure;

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FOUR FEATURES FOR OPERATOR SAFETY

1	2	3	4
STORED-ENERGY CLOSING	SPRING-OPERATED OPENING	TIME-DELAY INTERLOCK	DEAD-FRONT CONSTRUCTION

Greater safety with

General Electric *ROLLOUT*

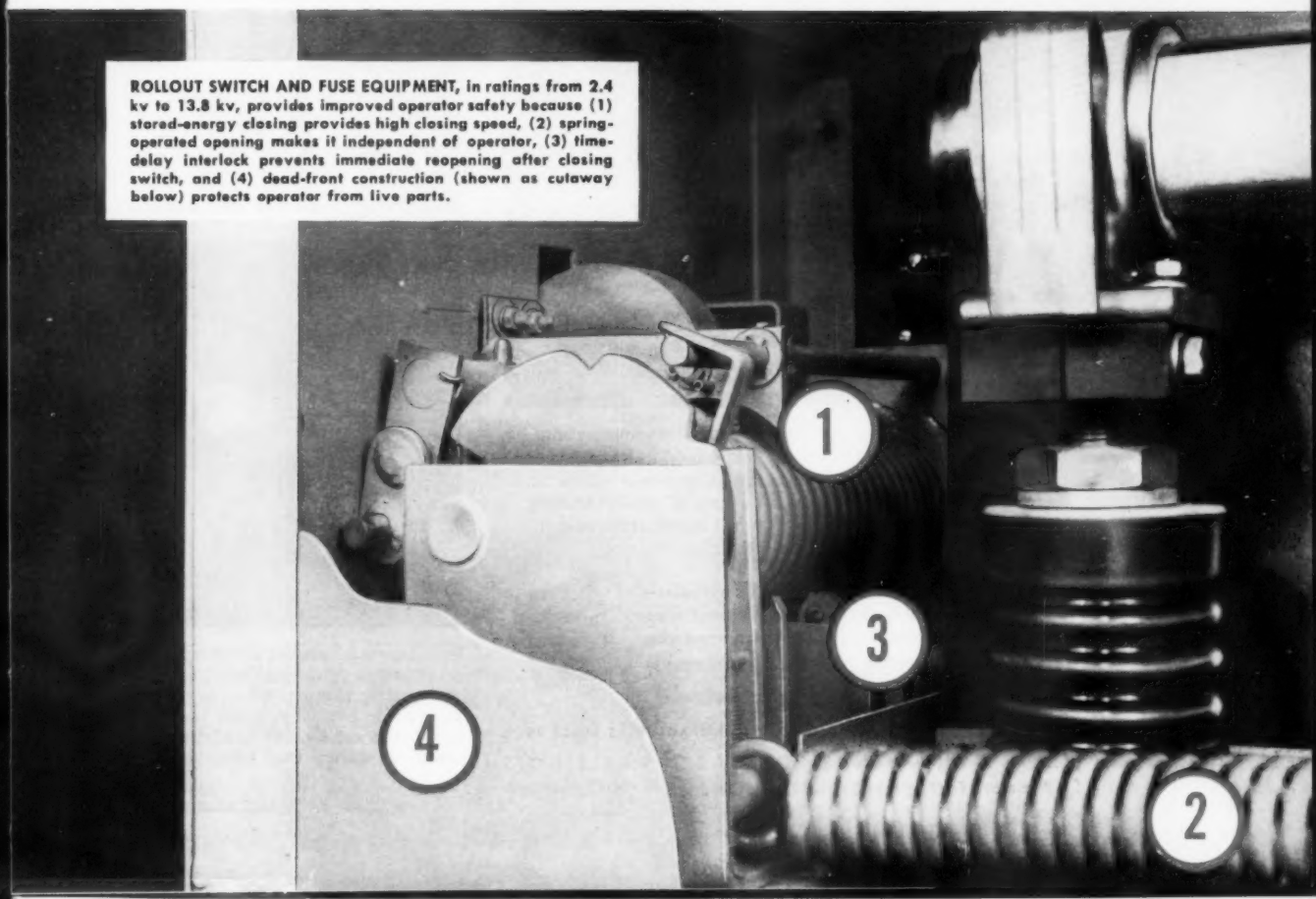
Switch and Fuse Equipment

Optimum safety is built into General Electric Switch and Fuse Equipment with stored-energy closing, spring-operated opening, time-delay interlock, and dead-front construction.

Improved protection, ease of maintenance and inspection, and installation versatility are other benefits you get with this switching and protection equipment. For more information call your nearest General Electric Apparatus Sales Office or write for Bulletin GEA-6623, General Electric Company, Section A514-4, Schenectady, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC



ROLLOUT SWITCH AND FUSE EQUIPMENT, in ratings from 2.4 kv to 13.8 kv, provides improved operator safety because (1) stored-energy closing provides high closing speed, (2) spring-operated opening makes it independent of operator, (3) time-delay interlock prevents immediate reopening after closing switch, and (4) dead-front construction (shown as cutaway below) protects operator from live parts.

NOW···GLOBE OFFERS···
two new INTERCHANGEABLE trays for support of cables, wiring and tubing

★ Engineered for uniform design and easy installation
★ Steel or aluminum construction
★ Complete accessories for SPEEDIER Installation
★ No sharp edges to damage cables
★ Complete interchangeability

Now, for the first time, two types of cable trays, one a ladder type and the other a basket type, are available to be used INTERCHANGEABLY at any given location, depending on the type and weight of the cables to be suspended. The advantages of each type tray can thus be used to the fullest extent. Globetray, the ladder type, is intended for use where festooning is not a problem, while Cable-Strut, the basket type, is intended for the support of communication wire, instrument tubing and control cables in automation applications.

These two cable trays have been thoroughly field tested in hundreds of large industrial installations, in new plant construction, in power plants, in modernization, and for power distribution in all types of manufacturing processes. A new catalog, just off the press, gives full information and installation techniques. Ask for your FREE copy today.

Distributors are to be found in all principal cities—consult the yellow pages in your phone book under "Gratings" or "Conduits" for the one nearest you.

109

PRODUCTS DIVISION

The **GLOBE** *Company* MANUFACTURERS SINCE 1914

4016 SOUTH PRINCETON AVENUE, CHICAGO 9, ILLINOIS

For more facts circle 536 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

hardness and strength increase, ductility is reduced, but dimensions of the metal remain unchanged.

In aluminum, neutron bombardment also results in increased electrical resistance and decreased softening temperature. Electrical resistance is increased only slightly in copper. In steel and iron, corrosive attack is accelerated, but stainless steels and other nickel alloys show no change in electrical or magnetic properties.

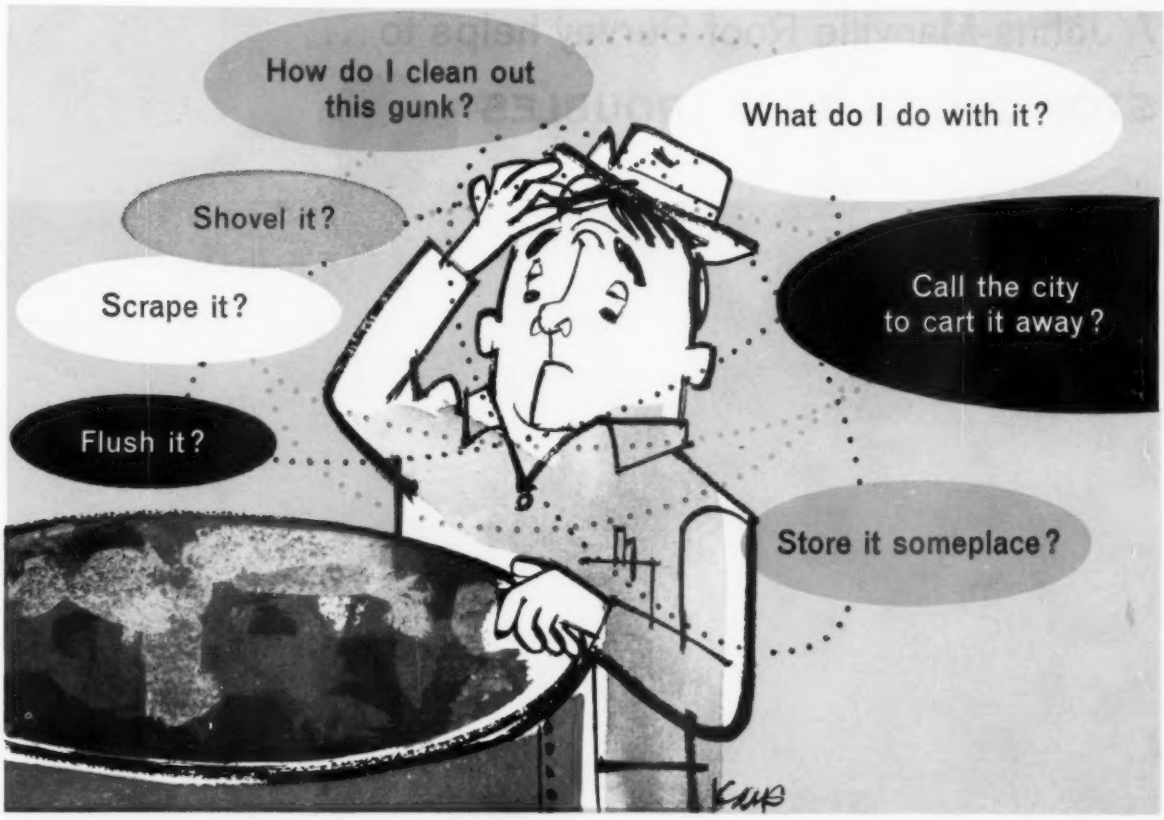
Plastics are affected most severely by gamma radiation, generally above 10^{17} nvt. They discolor, disintegrate and lose their electrical properties.

Like plastics, rubbers are suitable for use up to 10^{12} nvt and are most severely damaged by gamma radiation. Butadiene and styrene copolymers appear to stand up best to a nuclear environment. Neoprene tends to harden and disintegrate rapidly. Silicones are useful principally where both temperature and radiation requirements must be met.

Protective finishes which are inherently radiation-resistant, are anodized aluminum, nickel-plated steel and silver plating. *From Technical Supplement to Cannonade, published by Cannon Electric Co., Los Angeles, Calif.*

Reclaiming Stainless and Silver

Stainless steel brazed honeycomb panel is dipped in nitric acid solution to separate silver brazing. Silver is reclaimed by outside company, while uncontaminated steel can be salvaged. (From a release of Martin Co., Baltimore, Md.)



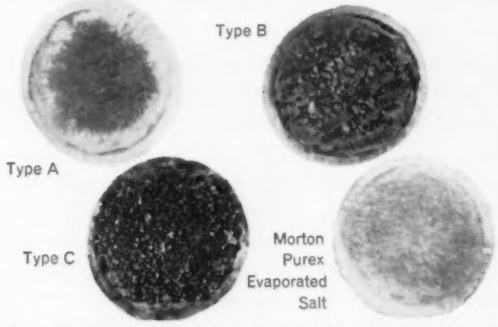
Brine tanks never need cleaning out when you use sludge-free Purex Salt

Yes, we mean never! You prevent costly shutdowns for maintenance. You save time and completely eliminate labor costs for cleaning out brine tanks. For Morton Purex Salt is 100% soluble. It will leave no accumulation of sludge—shale and sulphates—in either your brine or water-softening system.

What's more, none of your purchase price or freight bill for Purex goes toward paying for insolubles. This is an important saving, for in every 100 lbs. of ordinary salt you buy, you assume the risk of paying for up to 5 lbs. of shale and sulphates. In a 50-ton carload of ordinary salt, you may pay for as much as 5,000 lbs. of sludge. And you buy salt with "built-in" maintenance problems.

With sludge-free Morton Purex Salt, you get high-purity evaporated salt made in a controlled-particle size to prevent packing and channeling. Purex can be used in bulk wet storage systems and in the Morton Model E Brinemaker.

These filter pads (approximately 1/6 actual size) show you how much insoluble matter (sludge) you get in just 5 lbs. of various types of salt



Tests for insolubles taken from these random samples show you that Morton Purex is the only one that contains no wasteful sludge or insolubles.

For more information about Morton Purex Salt and for free, expert help on any water-softening or brine-making problem, write or wire:

MORTON SALT COMPANY
INDUSTRIAL DIVISION
Dept. PE-7-58, 110 N. Wacker Drive, Chicago 6, Illinois

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A Johns-Manville Roof Survey helps to . . .

STOP COSTLY ROOF TROUBLES

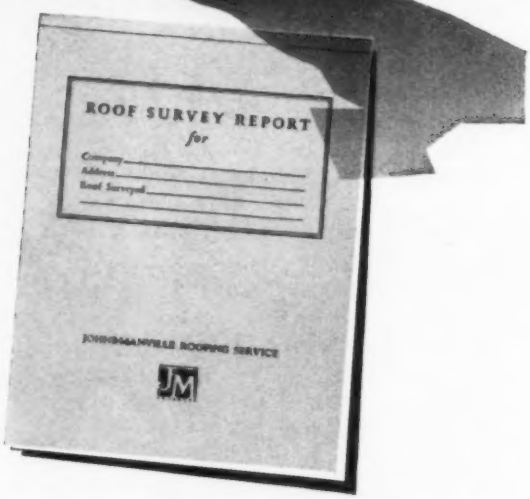
DON'T BE CAUGHT with costly roofing troubles. Even though your roof never has leaked, there may be defects you haven't noticed.

To spot possible trouble, it pays to have your roof inspected by an expert every year or so. And, your J-M Roofing Contractor is the man to do it.

His inspection will cover not only the main roofing areas, but also the flashings, parapet walls, skylights, drains, pent-houses . . . everything on your roof that has a bearing on its ability to keep out the weather.

For a free Roof Survey, call your J-M Roofing Contractor. He is listed in the Classified Telephone Directory.

For further information about what may be happening to your buildings, send for the 40-page booklet, "Things You Should Know About Your Roof." Write to: Johns-Manville, Box 158, New York 16, N.Y. In Canada, write: Port Credit, Ontario.



The J-M Roof Survey is made without obligation. A written report will tell you what defects are found, what you should do and how you can do it.

JOHNS-MANVILLE

JOHNS MANVILLE JM PRODUCTS

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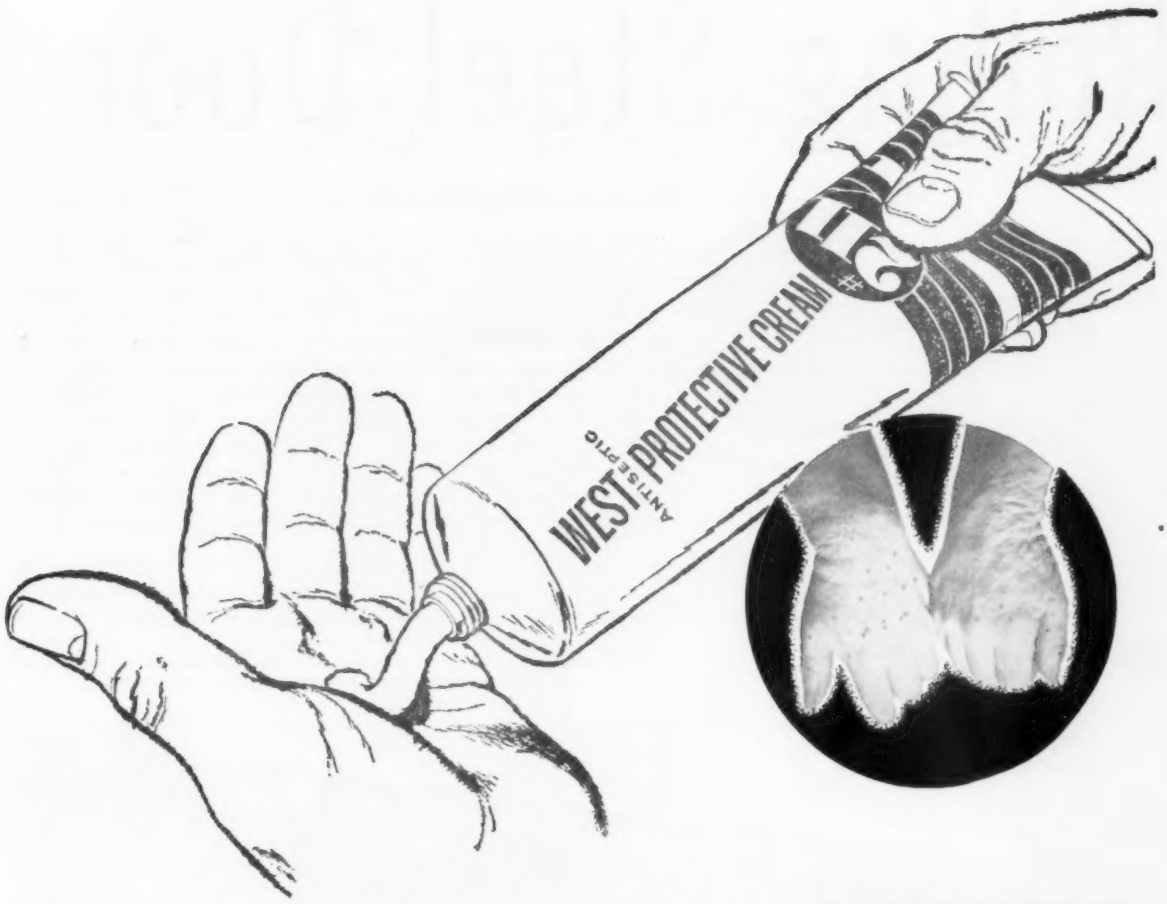

Ten weeks protection against **DERMATITIS**

The above 10 oz. tube contains enough cream to protect the hands of a valued employee for ten weeks. West Antiseptic Protective Creams are formulated in accordance with the accepted recommendations of leading authorities in the field of Industrial Dermatitis. They are used as easily as ordinary hand creams. The result: comfortable, invisible protection that keeps industrial irritants from prolonged contact with the skin.

West Antiseptic Protective Creams are normally used four times a shift. They are part of a program that overlooks no contributing source of dermatitis — the highly successful West Program of Dermatitis Prevention and Control.

How does it work?

Lanokleen, antiseptic soaps and other specially formulated hand cleaners insure safe, effective cleansing. Germicidal specialties protect against bacterial infections. "Vinylite" aprons and armguards prevent clothing contamination. And, of course, Antiseptic Protective Creams help protect exposed skin areas.

The West Program of Dermatitis Prevention and Control is an inexpensive way to protect workers and management against the needless penalties of dermatitis. Interested? Just send the coupon. Or call your local West office.

Programs and Specialties for Preventive Maintenance and Protective Sanitation

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WEST DISINFECTING DIVISION

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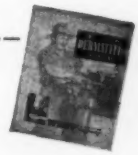


☐ Please send me your 24 page booklet, "The Control of Dermatitis in Industry."
☐ Please have a West Representative telephone for an appointment.

Name.....

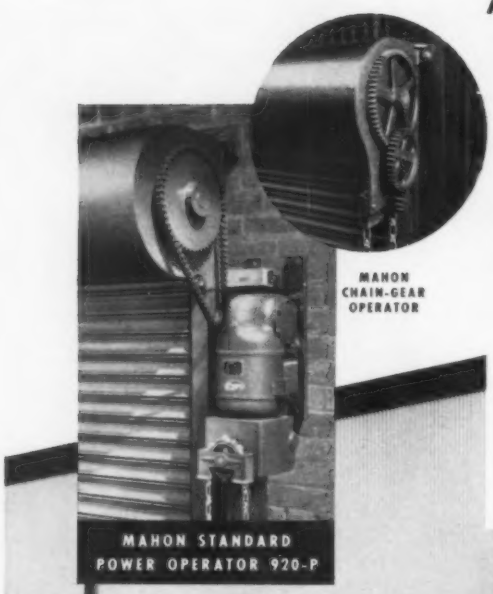
Position.....

Mail this coupon with your letterhead to Dept. 13.

For more facts circle 539 on Reply Card

Rolling Steel Doors

Manually, Mechanically, or Electrically Operated

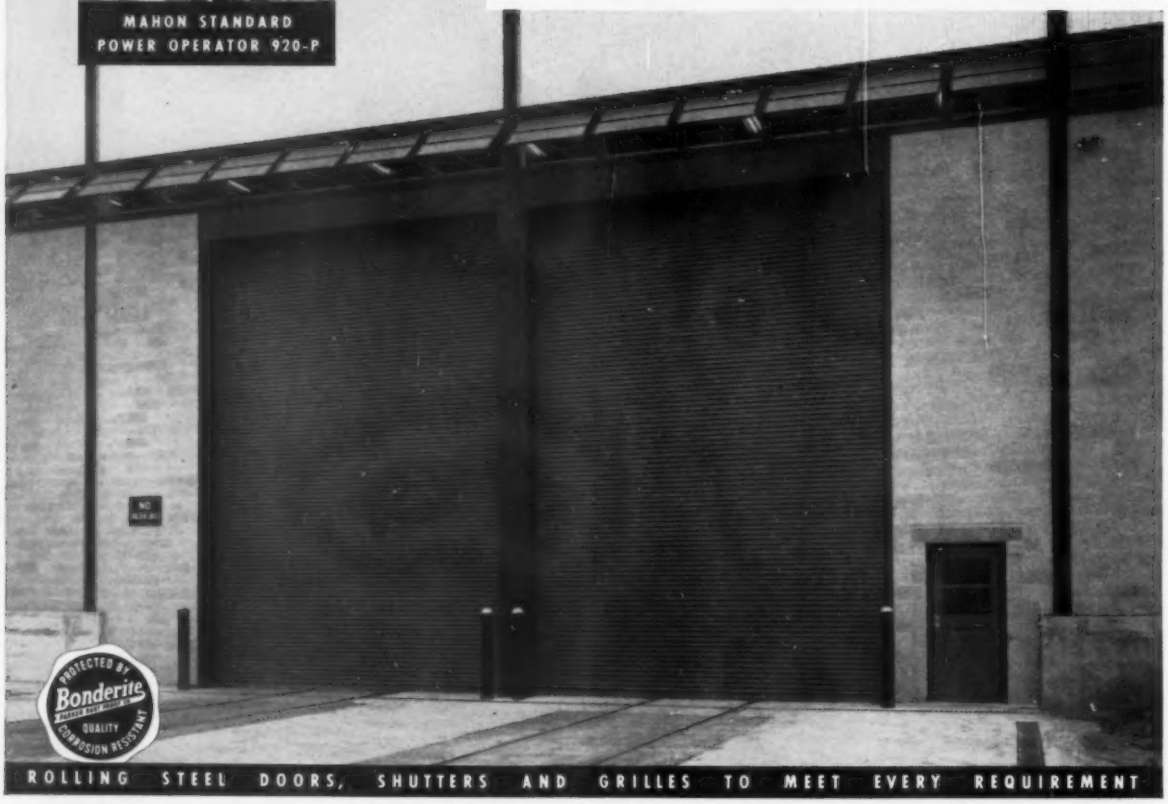


When you select a door for truck openings, railroad openings, or shipping dock openings, you want permanence, space economy, maximum protection against intrusion and fire, and fast, reliable operation. No other type of door can meet all of these demands so completely as a good, all-metal rolling steel door. The vertical roll-up action requires no usable space either inside or outside the opening . . . and there are no overhead tracks or other obstructions to restrict headroom and interfere with crane handling. When you buy a rolling steel door, check specifications carefully . . . you'll find, through comparison, that Mahon Rolling Steel Doors are built better to give you better service over a longer period of time. See Sweet's Files for complete information including Specifications, or write for Mahon Catalogue G-58.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales-Engineering Offices in Detroit, New York and Chicago • Representatives in Principal Cities

Manufacturers of Rolling Steel Doors, Grilles, and Automatic Underwriters' Labeled Rolling Steel Fire Doors and Fire Shutters; Underwriters' Rated Metalclad Fire Walls, Insulated Metal Curtain Walls, Electrified M-Floors, Acousticol and Troffer Forms, Acoustical Metal Ceilings, Steel Roof Decks, and Long Span M-Decks.



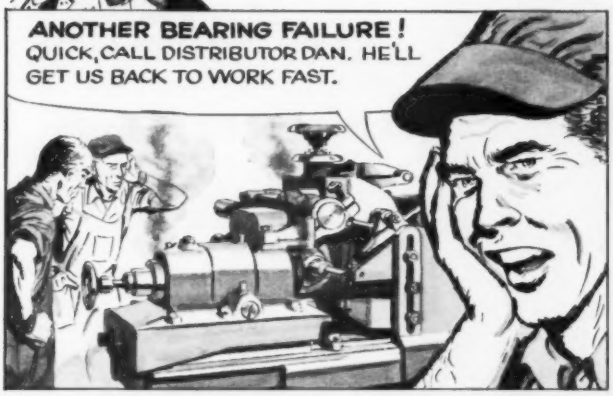
ROLLING STEEL DOORS, SHUTTERS AND GRILLES TO MEET EVERY REQUIREMENT

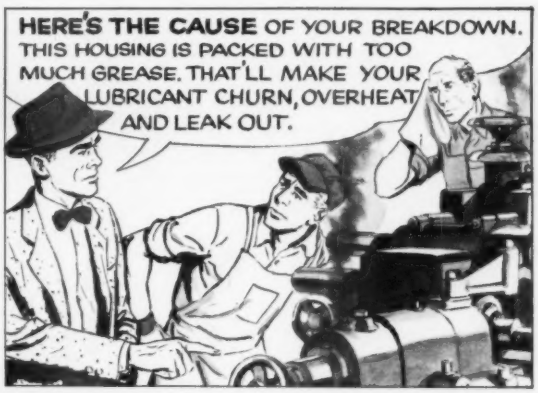
Illustrated here are Two of Five Mahon Power Operated Rolling Steel Doors installed in the Udylite Corporation's new plant, Detroit, Mich. Architects: O'Dell, Hewlett & Luckenbach. General Contractors: Barton-Malow Co.

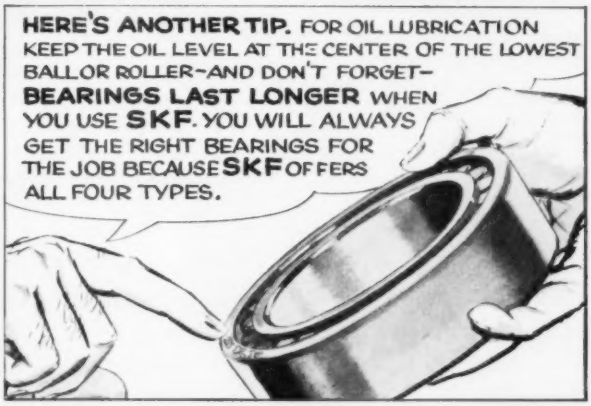
MAHON

For more facts circle 540 on Reply Card

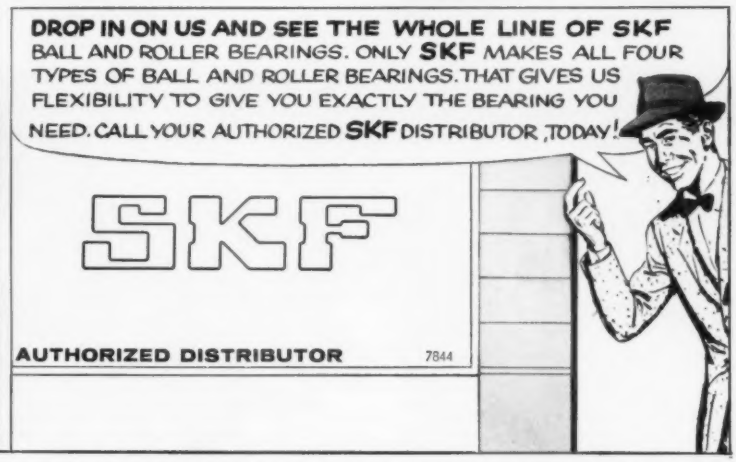
The real life adventures of DISTRIBUTOR DAN the SKF bearing man




HERE'S THE CAUSE OF YOUR BREAKDOWN. THIS HOUSING IS PACKED WITH TOO MUCH GREASE. THAT'LL MAKE YOUR LUBRICANT CHURN, OVERHEAT AND LEAK OUT.


HERE'S ANOTHER TIP. FOR OIL LUBRICATION KEEP THE OIL LEVEL AT THE CENTER OF THE LOWEST BALL OR ROLLER—AND DON'T FORGET— BEARINGS LAST LONGER WHEN YOU USE SKF. YOU WILL ALWAYS GET THE RIGHT BEARINGS FOR THE JOB BECAUSE SKF OFFERS ALL FOUR TYPES.

CALL ME ANY TIME YOU HAVE PROBLEMS. IT'S MY JOB TO KNOW BEARINGS... AND WHAT'S MORE, TO KNOW WHAT CAUSES ANY BEARING PROBLEM YOU COULD HAVE.


DROP IN ON US AND SEE THE WHOLE LINE OF SKF BALL AND ROLLER BEARINGS. ONLY SKF MAKES ALL FOUR TYPES OF BALL AND ROLLER BEARINGS. THAT GIVES US FLEXIBILITY TO GIVE YOU EXACTLY THE BEARING YOU NEED. CALL YOUR AUTHORIZED SKF DISTRIBUTOR, TODAY!
SKF
AUTHORIZED DISTRIBUTOR
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EVERY TYPE—EVERY USE

SKF

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

*REG. U. S. PAT. OFF.

For more facts circle 541 on Reply Card

OPERATION AND PRODUCTION —pointers for the industrial plant engineer

Edited by Vern Kempf

Reel Storage Rack Saves Space

Contributed by Harry J. Miller

WIRE REELS are commonly stored in rows on the floor with an aisle between them. When a particular size of wire is needed, the reel is rolled up to the measuring machine where it is mounted on supports to permit uncoiling. After use, the reel is removed from the uncoiler and rolled back to its original location.

To eliminate this time-consuming job, we constructed this vertical reel storage rack. The reels are lifted into place by a fork-lift truck and stay on the rack until they are empty. The wire is fed off of the reel directly into the measuring machine. After the required amount has been cut off, the remainder is wound back on the reel.

The vertical supports of the rack are made of six-inch I-beams with notches cut in the flanges to accommodate the reel axles. Additional support is provided by small pieces of 1½- by ¼-in. flat steel welded next to the notch. The vertical spacing of the columns and the distance between notches should be worked out to fit the various sizes of reels which are commonly used.

Reel storage rack occupies small space, permits rapid inventory of wire stock

Static Control Reduces Downtime

ELECTRICAL CONTROL logic elements with no moving parts are expected to increase production on a new spark plug assembly machine at General Motor's AC Spark Plug plant in Flint, Michigan. The increased production is predicted and based on the elimination of downtime common to conventional control systems.

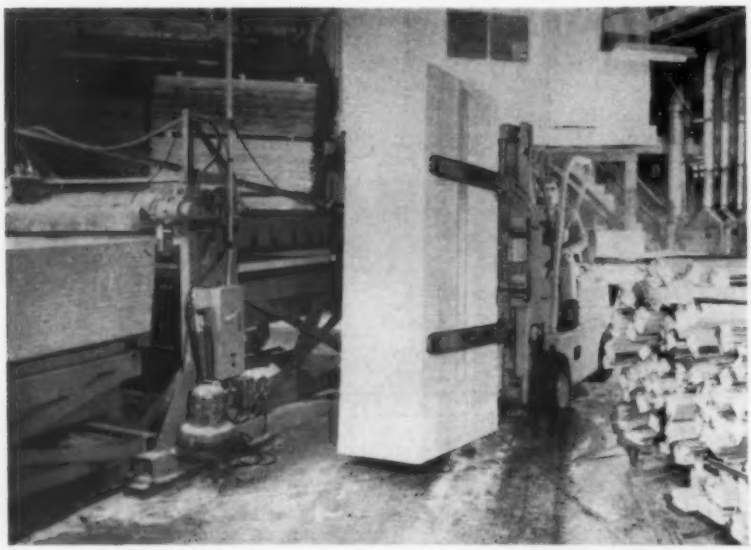
The spark plug assembly machine uses a control panel composed of 127 General Electric static control logic elements. As these elements have no moving parts, life expectancy is considerably longer than with conventional controls because

(Continued on page 58)

Turn-Over Attachment Speeds Two-Side Inspection of Plywood Panels

HANDLING plywood panels has been simplified at U. S. Plywood's Shasta Division plant at Redding, California, by a fork truck that not only lifts and carries but also turns its load 180 degrees.

Equipped with a hydraulically operated upender attachment, the Clark fork truck moves panels between five rough patch stations, two sanders, panel sawing, one branding and plugging station and the storage and shipping area.



Upender turns panels over for inspection, permits vertical transporting in aisles

At rough patch stations, panels have to be turned for patching operations on both sides. Previously this was done manually, one panel at a time. Now the panels are turned 40 at a time by the fork truck attachment.

The device consists of two pairs of forks mounted on a revolving plate. One pair of forks slide under the load in the usual manner. The second pair of forks clamp down on top of the load under hydraulic pressure. Enough force is exerted to hold the load secure while it is being turned.

An additional advantage of the upender attachment is that it permits loads to be carried vertically rather than horizontally. Often carrying panels eight feet long, this permits easy maneuvering through narrow aisles and freight car doors.

faster TO ERECT

faster TO INSTALL

faster TO RE-ARRANGE

faster TO PAY FOR ITSELF

DELUXE STEEL SHELVING

faster BECAUSE . . .

. . . you realized that a shipment of knockdown shelving parts has no useful value. It must first be assembled into shelving racks for storage utility. The faster these racks are erected, the lower your installation cost. So, because Deluxe steel shelving is erected faster, your *installed cost* is the lowest.

The film strip shows 6 engineering features of Deluxe steel shelving that promote faster erection. Take the patented Deluxe boltless shelf bracket . . . it replaces 90% of the time-consuming nuts and bolts and allows not only quick installation, but easy shelf adjustment.

THE PROOF: At the 1958 Maintenance Show in Chicago, two men erected a complete closed section of Deluxe Boltless Steel Shelving in *less than 5 minutes.*

Call your local Deluxe dealer or write for the new, complete Deluxe Shelving Catalog No. 30.

Patented Boltless Shelf Bracket

Factory Built-in Shelf Reinforcing

One-piece Bin-type Upright

Snap-in Dividers (horizontal & vertical)

Clip-on Bin Fronts

Bottom Shelf Support and Floor Angle

DELUXE

DELUXE METAL FURNITURE COMPANY · Warren 7, Pa.

A Division of the Royal Metal Manufacturing Company

For more facts circle 542 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 56)

the component parts are not subject to wear and erosion.

A quick and accurate means of checking machine operation is provided by monitor lights attached to the plug-in elements. This plug-in design makes maintenance simple if replacement of an element is ever necessary.

Gear-Type Belt Stops Slipping

Looms developed by the New York Wire Cloth Company have increased production of woven insect screening by 50 per cent. One of the problems encountered in the design of these new looms was that V-belt slippage caused slight imperfections when a stop occurred.

A timing-belt drive, supplied by T. B. Wood's Sons Company, Chambersburg, Pa., has solved this production difficulty. The belt is run tight on both sides to eliminate slack and resulting backlash. The neoprene teeth on the belt engage grooved, gearlike pulleys. There is no slippage, and the belt maintains its speed accurately. There is a minimum of stretch as the belt is reinforced by helically-wound steel cables.

Due to the relatively inaccessible location of the belt, it is important that maintenance requirements be infrequent. There is no metal to metal contact and no lubrication is required. The belt does not depend upon friction for the transmission of power which, in turn, contributes to its long life.

Gear-type belt solves slippage problem when starting and stopping loom

Epoxy Resin-Silica Compound Solves Tough Corrosion Problem

Maintenance is likely to be a tough and expensive proposition wherever corrosive materials are used for cooling or process work. Faced with a serious salt water corrosion problem, the California Oil Company's refinery at Perth Amboy, N. J., used a special epoxy resin and silica compound to protect the joints in cement-lined pipe.

In sea water pumping operations, casings of large pumps may be pitted and scarred by abrasive materials found in the water. Even in installations protected against salt water by cement-lined pipes, seepage is a constant threat. Any defect in the lining material will expose the bare pipe to rapid corrosion.

Repair compounds made by Smooth-on Manufacturing Co., are simple to work with, can be used

(Continued on page 60)

Magnetic Rolls Help Make Low-Cost Feeding and Stacking Devices

Forty-pound sheet steel blanks, which will ultimately become the outer shell of refrigerators, are being fed into a 200-ton notching press with magnetic rolls at one of the Hotpoint Company's manufacturing plants in Chicago.

The rapidly rotating Eriez magnetic roll, Fig. 1, is about to feed the leading edge of the sheet and propel it into the press, where six additional magnetic rolls will carry it through. At the discharge end of the press, Fig. 2, another set of magnetic rolls is used. At this point, they are positioned above the steel blanks so that the magnetic action of the rolls suspends the sheets as they move out of the press. When the sheets are clear of the press, the rolls let them drop clear for easy piling.

Magnetic rolls are replacing pinch rolls, formerly used, and have done away with labor usually required to pull out sheets for piling.

Equally effective are rubber-covered magnetic rolls that are used where it is important to prevent marring the sheets.

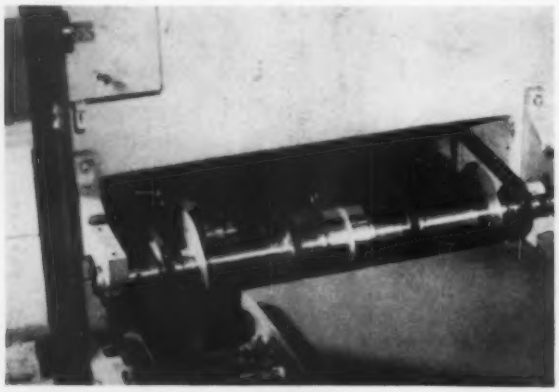


Fig. 1. Magnetic roll replaces feed pinch roll on heavy press

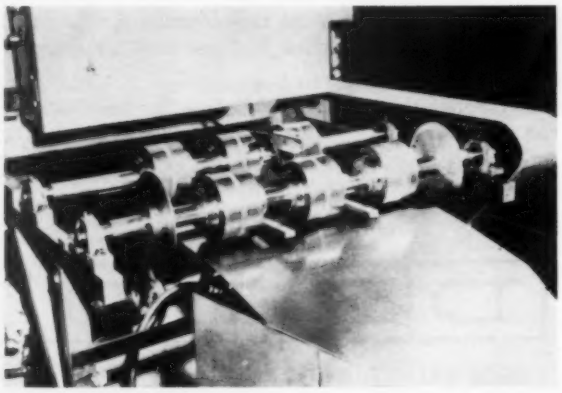
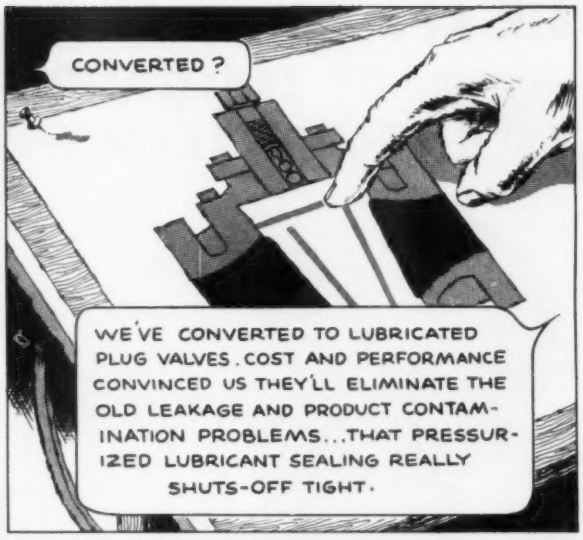
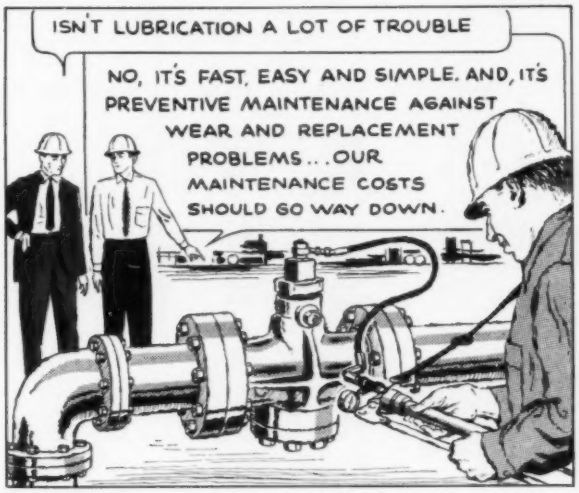


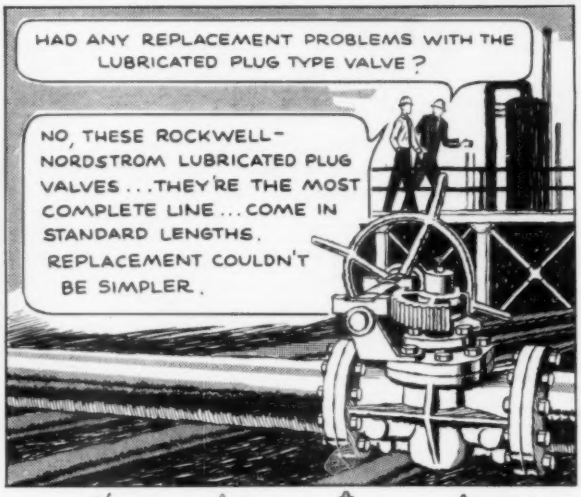
Fig. 2. Position of exit magnetic rolls permits easy piling

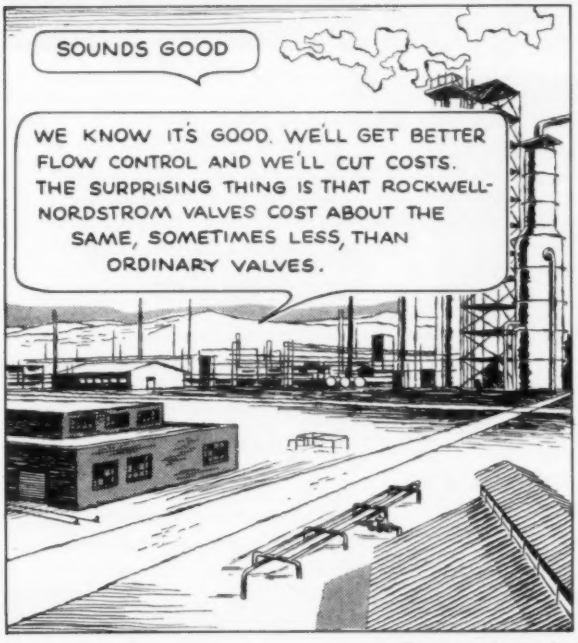
COST CUTTING IN ACTION

by Rockwell-Nordstrom


CONVERTED ?
WE'VE CONVERTED TO LUBRICATED PLUG VALVES. COST AND PERFORMANCE CONVINCED US THEY'LL ELIMINATE THE OLD LEAKAGE AND PRODUCT CONTAMINATION PROBLEMS...THAT PRESSURIZED LUBRICANT SEALING REALLY SHUTS-OFF TIGHT.


ISN'T LUBRICATION A LOT OF TROUBLE
NO, IT'S FAST, EASY AND SIMPLE. AND, IT'S PREVENTIVE MAINTENANCE AGAINST WEAR AND REPLACEMENT PROBLEMS... OUR MAINTENANCE COSTS SHOULD GO WAY DOWN.


HAD ANY REPLACEMENT PROBLEMS WITH THE LUBRICATED PLUG TYPE VALVE ?
NO, THESE ROCKWELL-NORDSTROM LUBRICATED PLUG VALVES... THEY'RE THE MOST COMPLETE LINE... COME IN STANDARD LENGTHS. REPLACEMENT COULDN'T BE SIMPLER.


SOUNDS GOOD
WE KNOW IT'S GOOD. WE'LL GET BETTER FLOW CONTROL AND WE'LL CUT COSTS. THE SURPRISING THING IS THAT ROCKWELL-NORDSTROM VALVES COST ABOUT THE SAME, SOMETIMES LESS, THAN ORDINARY VALVES.

ROCKWELL-Nordstrom VALVES

it's **ROCKWELL** MANUFACTURING COMPANY

Rockwell-Nordstrom valves are available in a complete range of sizes and ratings in semi-steel, steel, stainless steel and other corrosion resisting metals.

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Rockwell-Nordstrom Valve Division
Department CS Pittsburgh 8, Pa.

☐ Please send me complete information on Rockwell-Nordstrom valves for process, industrial and manufacturing flow control.

☐ Please send me the name of your nearest distributor . . . ask him (to) (not to) call immediately.

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AIR AND MATERIALS MOVING... OR VENTILATION WITH TROUBLE-FREE EFFICIENCY

"Buffalo" Industrial Exhausters

For many years these rugged "Buffalo" fans have been noted for dependable performance in hundreds of tough industrial jobs. They efficiently handle fumes, gases, fogs and dust, at temperatures up to 900°F. — move a wide variety of materials, including those carried by pneumatic systems — deliver induced draft for small boilers.

"Buffalo" Industrial Exhausters bring you many advantages:

● Peak Performance — thanks to smoother, more efficient air flow resulting from new "Buffalo" improvements in rotor and casing design.

● Adaptability — optional equipment includes interchangeable air or material wheels and heat slinger for high temperature conditions. Housing is easily reversible or adjustable.

● Built for Severe Service — with all-welded steel plate construction, and oversize anti-friction bearings and shafts.

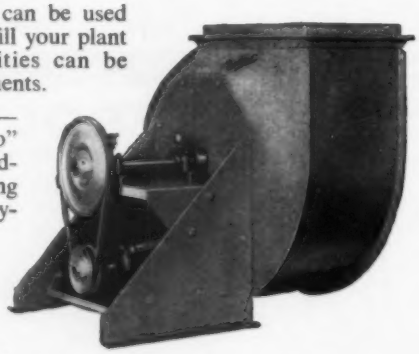
Write for Bulletin FI-110.

"Buffalo" Belted Vent Sets

These flexible "package" units are easily adaptable to your specific plant ventilating needs. They're economical to install, economical to operate. They're ideally suited for use in small, independent plant systems — for larger systems with variable requirements — for separate systems in different plant areas.

Check these advantages of "Buffalo" Belted Vent Sets:

● Compact, Easy-To-Install — can be used singly or as multiple units to fulfill your plant ventilating needs. Fan capacities can be adjusted to meet future requirements.



● Quiet, Efficient Performance — resulting from the famous "Buffalo" designed inlet vanes and backward-curved blades with non-overloading characteristic. Rotors are factory-balanced.

● Versatile — Capacities from 500 to 20,000 cfm. Available with all-weather drive cover for outdoor installation.

Write today for Bulletin 3720-A.

"Buffalo"

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166 Mortimer Street • Buffalo, N. Y.
Buffalo Pumps Division, Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

INDUSTRIAL EXHAUSTERS • BELTED VENT SETS • PROPELLER FANS • "E" BLOWERS — EXHAUSTERS

For more facts circle 544 on Reply Card

OPERATION — PRODUCTION

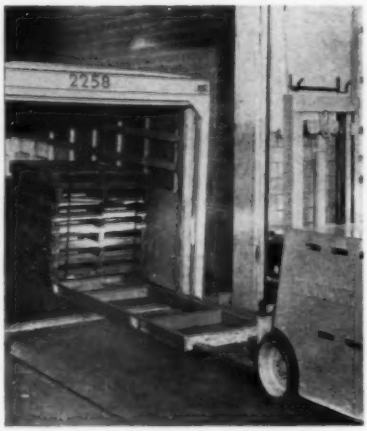
(O and P begins on page 56)

in both the shop or field and are designed to meet situations like these. Since the resin and catalyst making up the compound are not mixed until immediately before using, both materials have good shelf life.

One version of the compound comes in pairs of self-metering tubes that permit the user to obtain the right composition and avoid waste by mixing equal lengths squeezed out of each tube. Pot life of the mixture is about 30 minutes at a temperature of 70 F.

The average patch sets up in about four hours.

Push Bar Solves Loading Problem



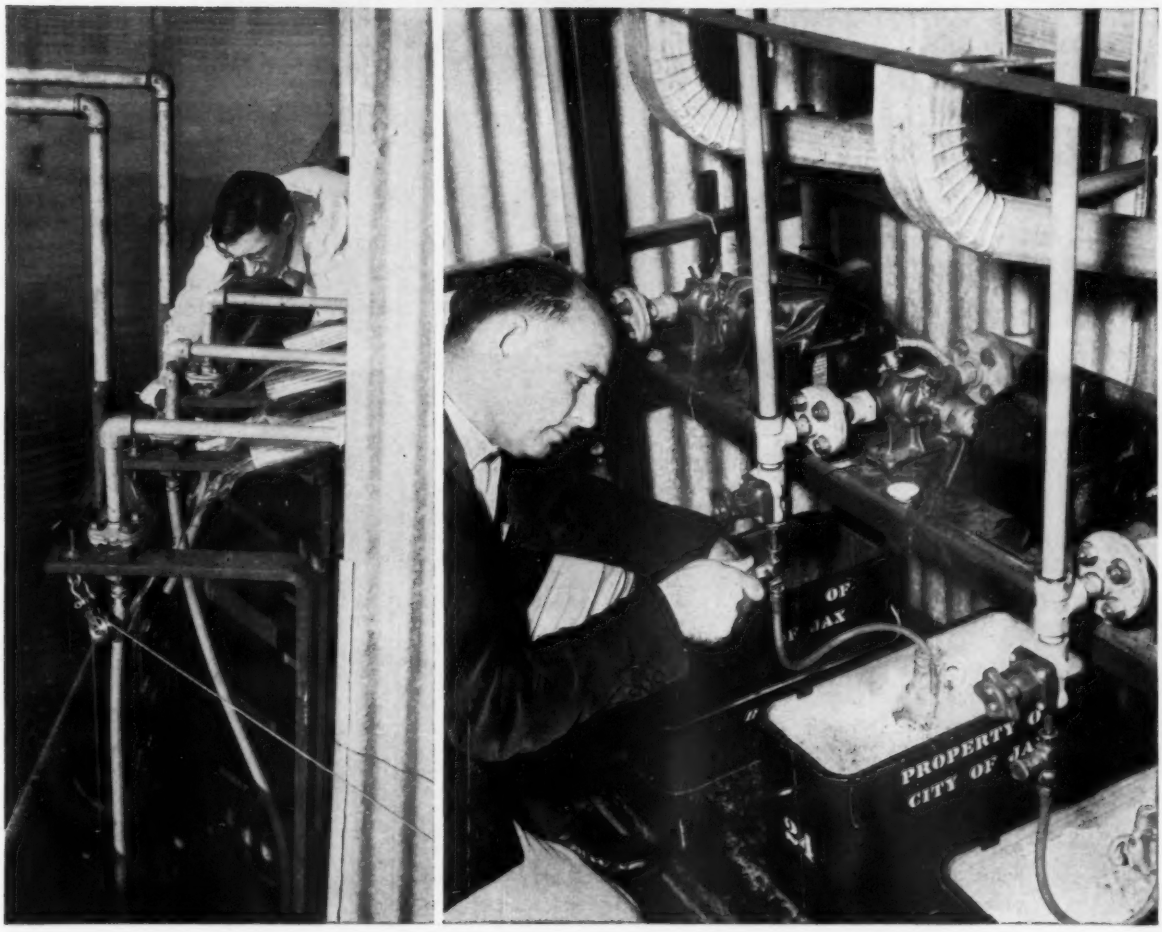
When truck doorways are too low or when floors are too weak to permit entry of lift trucks, this push bar is used at the Electric Controller and Manufacturing Division of the Square D Company. Made of magnesium, it is 28 in. wide, 96 in. long and weighs 40 lb

Automatic Transfer Conveyor Reduces Labor Costs

MOVING STEEL from a sheet shear to a press brake is a material handling problem recently solved by engineers at the Westinghouse Electric Corporation's TV-Radio Division. An elevating transfer conveyor, designed by works engineers, reduced the cost of moving material between these two machines by 75 per cent.

The transfer conveyor, consisting of channel-mounted wheel rollers, is

B.F.Goodrich



Koroseal helps analyze water in St. Johns River

IN a small building atop the Main Street bridge in Jacksonville, Florida are three motor-driven paddle pumps. Their job is to suck up water from the St. Johns River at three different depths—3, 38 and 72 feet—for use in continuing year-after-year laboratory analyses.

But chlorine content of the water runs high—reaching a maximum of 12,000 PPM at times—and so the pipes had to have unusual resistance to chlorides. That's why the City of Jacksonville chose B.F.Goodrich rigid Koroseal PVC pipe, valves and fittings. City engineers report continuous trouble-free operation.

Unusual application? Yes, but Koroseal rigid polyvinyl chloride pipe now provides excellent service in countless unusual applications where standard metal piping is inadequate. It's unaffected by most alkalies and acids, and is completely inert in the presence of oil, alcohol, and salt solutions. Unusually strong, it has high impact resistance and is available in tubes, rods, valves and sheets.

Other reasons for the growing popularity of Koroseal PVC are low initial cost . . . ease of installation . . . light weight . . . economical maintenance. It can be threaded, cut, welded or drilled —and never needs painting.

To get more information on how Koroseal can make your operation more efficient and profitable, fill in and mail the coupon to your right.

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B.F.Goodrich

INDUSTRIAL PRODUCTS

B.F.Goodrich Industrial Products Co.
Dept. PE-7
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Please send me free booklets on:

☐ Rigid Koroseal Pipe
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Have You Figured Your Ratio of . . .

daylight to dollars?

There's more than meets the eye in a brass tacks approach to the problem of the best and most economical glazing medium you can use. Before you decide on any material for windows, skylights, partitions or other openings, remember that glass and glass alone gives you the proven performance you need for better daylighting at lowest cost. Write today for catalog 58-I, containing data on translucent, light diffusing glass. Address Dept. 13.

There is no Substitute for GLASS

- It is non-combustible . . . won't burn
- It is rigid . . . doesn't sag, warp or bend
- It has a permanently hard, impervious surface, unaffected by time, abrasion and exposure to the elements
- It won't corrode or stain
- It resists chemicals, acids, solvents, etc.
- It retains its original clarity and brilliance
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WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRED GLASS

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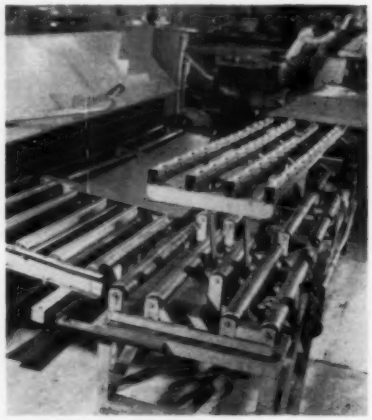
OPERATION—PRODUCTION

(O and P begins on page 56)



Shop-made elevating conveyor solves problem of transferring sheets from shear, at left, to press brake, at right

elevated by an air cylinder from its "down" position between the cylindrical rolls to its "up" position shown in the figure. In operation, the first sheared sheet is conveyed by gravity over the cylindrical rolls to a position above the transfer conveyor. When the sheet hits a stop bar on the transfer conveyor, a limit switch is tripped, operating the air cylinder. The transfer conveyor moves to the "up" position and gravity rolls the sheet into position near the press brake operator.

Mechanical stops hold the second sheet from the sheet shear until the transfer conveyor returns to the "down" position. To prevent feeding sheets too fast to the press brake, an electrical interlock holds the transfer conveyor in the "down" position until the press brake operator uses the first sheet.

Insulation Forms Freezer Walls

TIME AND COST problems on a new freezer tunnel were solved at Minute Maid Company's Leesburg, Florida, plant by using blocks of cellular glass insulation which served as both insulation and building blocks. The Foamglas insulation, a product of Pittsburgh Corning Corporation, has an ultimate compressive strength of 100 lb per sq in., which allowed the use of free-standing walls of the insulation alone.

To form the walls, four-inch pipe

In Constant Service For 15 Years

Three Interlocking Tramrail Cranes Keep Hardware Materials Moving

Floor-operated, push-button-controlled, completely motorized transfer cranes in open warehouse. The cranes run on three tracks supported by the wood trusses. A simple adjustment for leveling Cleveland Tramrail track makes it ideal for any building, especially wooden structures which are subject to sagging and shifting.

Excerpt from letter of Mr. Gilbert Schnitzer, Pres., Woodbury Hardware Company, Portland, Oregon.

". . . and if anyone should inquire of us as to service they have given us in the past 15 years, we shall be very happy to give him an excellent testimonial.

"The cranes have been in constant service since they were installed. The warehouse was first occupied by Woodbury & Co. for storage and distribution of steel plates, bars, structurals, and kindred items, and the cranes had heavy service for several years. The capacity of 3 tons, as you might imagine, was often exceeded, but the flexible suspension, plus the excellent material and construction of the bridge and sturdiness of the hoists, took care of these occasional overloads."

THREE 3-ton, 67'-0" long Tramrail cranes on parallel runways provide fast, efficient handling for a tremendous assortment of hardware materials at the Woodbury Hardware Co., Portland, Oregon. One crane covers a large open warehouse room, and the other two operate over a mezzanine storage. Two or three of the cranes can be interlocked, as required, to permit loads to be run from one to the other. Thus materials can be handled from any point on the mezzanine to any area in the open warehouse room directly without rehandling the loads.

The Tramrail system has meant so much in speeding handling and easing the work at Woodbury Hardware that they declare: "We could not get along without it."

Write for free copy of Engineering and Data Booklet No. 2008. Packed with helpful information.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

7530 East 290th Street, Wickliffe, Ohio

For more facts circle 547 on Reply Card

GO AHEAD...

explain nuisance tripping to him

Heat's on, conditioner's out. How come?

Some annoying power interruptions are due to inadequate wiring. A vast number are due to nuisance tripping of circuit breakers or nuisance fuse blowouts.

Fuses and many circuit breakers operate on the basis of heat. They are sensitive to heat from within the circuit and without. Thus, on hot days thermal protectors are often near the tripping point even though the circuit is not fully loaded. As heat builds up, nuisance tripping results.

Heinemann hydraulic-magnetic circuit breakers *ignore heat*—respond only to *current* (amperage) which is the true determinant of electrical load. These circuit breakers will carry the full, safe capacity on the hottest days. Nuisance tripping just doesn't occur.

In Heinemann circuit breakers, actuation is entirely magnetic; inverse time delay is provided by hydraulic means. When protection is needed, interruption is fast. When the circuit is safe, power stays ON.

For consulting engineers, the full story is given in an informative booklet, Manual 101: "What You Should Know About Circuit Breakers." Write for your copy.

HEINEMANN

HEINEMANN ELECTRIC COMPANY
128 Plum Street, Trenton 2, N. J.

Circuit breakers

SA 1418

For more facts circle 548 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 56)

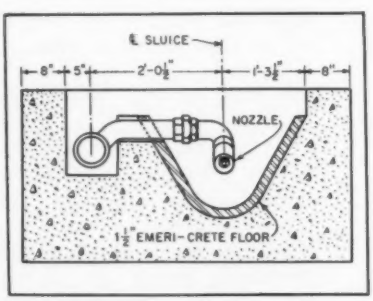
Two layers of glass insulation serve as both insulation and building side walls

columns were erected on the outer edge of a sub-floor slab to support steel bar joists. Two layers of five-inch Foamglas blocks were then erected unsupported as the freezer walls. Hot asphalt was poured into the juncture of the floor and sidewalls and a glass fiber expansion joint was used where wall insulation joined roof insulation.

Surfacer Extends Sluice Life

SLUICE-WAYS at Ford Motor Company's Rouge Plant Foundry effectively withstand the abrasion from water-borne cupola slag and dust, discharged at a constant driving pressure of 60 psi.

Several hundred lineal feet of these sluice-ways, equipped with water jets at 10 ft intervals, are in operation 16 hours a day, five days a week. Designed by Ford engi-



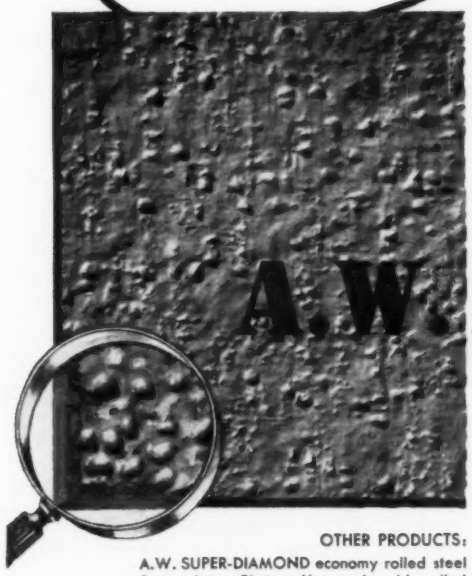
Special design prevents erosion of sluice-way floor due to water-borne slag

Unfair advantage . . . perhaps, but Casey will never set a new base-stealing record in this park. Now his sliding days are over! A.W. ALGRIP eliminates sliding or slipping wherever used . . . especially where sliding or slipping is never welcome . . . in *your* plant.

A.W. ALGRIP Rolled Steel Floor Plate provides super-safe footing under the most hazardous slipping conditions—on flat or even inclined surfaces.

A.W. ALGRIP Rolled Steel Floor Plate is made by a patented process in which a grinding wheel type abrasive is rolled—*not coated*—to a controlled depth, as an integral part of tough steel plate. Wear merely exposes more abrasive . . . safety lasts for the life of the installation.

Check your plant for slipping hazards and watch Accident Rates and high Insurance Costs "slide." Use A.W. ALGRIP as an independent flooring or as flooring overlay. Send the coupon for A.W. ALGRIP information, today.



A.W. ALGRIP ABRASIVE ROLLED STEEL FLOOR PLATE

ALGRIP—*approved for safety by Underwriters' Laboratories*

ALAN WOOD STEEL COMPANY
Conshohocken, Pa.

Please send A.W. ALGRIP Booklet AL-E29

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

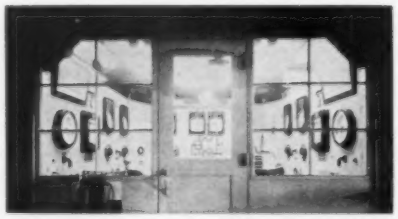
OTHER PRODUCTS:
A.W. SUPER-DIAMOND economy rolled steel floor plate—Plates—Hot and cold rolled sheet and strip—(Alloy and Special Grades)

For more facts circle 549 on Reply Card

New Wheelabrator® Ultra-Filtration keeps control room air "vacuum" pure

Wherever ultra-clean air is essential, as in this electrical equipment control room of a leading steel mill, low-cost Wheelabrator **Ultra-Filtration** provides the most effective and economical method you can employ.

Ultra-Filtration removes even the most minute particles of foreign matter from the atmosphere, leaving the air cleaner than clean — as close to absolute purity as any practical means can achieve.



Control and motor rooms, laboratories, instrument and spectograph areas — or areas that must have dependably and consistently pure air — are best protected by Wheelabrator Dustube Ultra-Filtration. Machinery and instruments function more consistently with minimum downtime and maintenance caused by air-borne contaminating particles. And the Ultra-Filtration unit itself works continuously and automatically, with no attention and practically no maintenance cost.

For detailed information write today for Bulletin No. 558-D

WHEELABRATOR
CORPORATION

859 South Byrkit Street, Mishawaka, Indiana
Canadian Offices: Scarborough (Toronto) – Montreal

For more facts circle 550 on Reply Card

OPERATION — PRODUCTION

(O and P begins on page 56)

neers, the sluice-ways have given six years of trouble-free service.

Sluice-way surfaces are made by vigorously raking and grooving the structural concrete base, soon after it is poured and formed. Immediately following the raking, the vertical and horizontal areas are given a slush coat of Portland cement and water. An Emeri-Crete mix, consisting of a low water ratio mix of Cortland emery aggregate and Portland cement, is then applied and tamped in place to a thickness of 1½ in.

Maintenance up to the present has been confined to a few isolated points where the initial blasts from the jets occur.

Sheet Metal Stored on Rollers

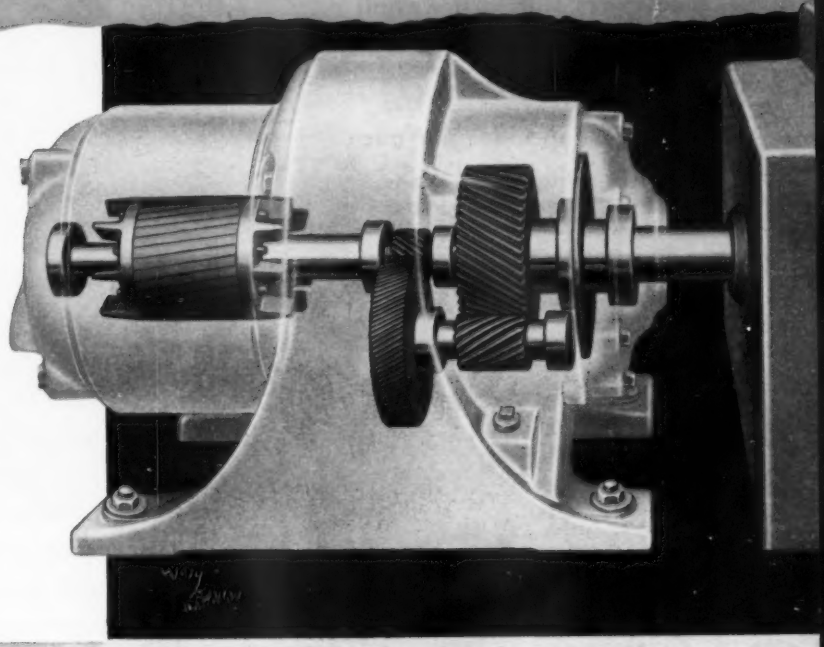
ROLLER storage racks speed up handling of strip sheet metal at Millard Brass & Copper Company, Boston, Mass. Advantages of the system include space saving, time saving, and very important protection of material. Formerly stocks were arranged on the floor in piles which made order picking difficult and failed to protect the softer metals.

The new rack consists of several decks of level roller conveyor lanes furnished by the Alvey-Ferguson Company. Original shipping boxes serve to hold the material for ease of handling and to reduce errors. Each type and weight of metal has its own place in the rack.

Level rollers help speed up handling of brass and copper in and out of racks

For more facts circle 551 on Reply Card ⟶

why use complex contraptions?



simplify...

with this self-contained geared power package...

U.S. Syncrogear motor!

Don't trust your production to cumbersome contraptions that slip... misalign... and create operator safety hazards. Instead of buying a "unit" that requires belts, pulleys, separate motor, and turnbuckle or rails to be added at extra expense... instead of spending costly production time on recurring adjustments—take the easy, simple, economical way to geared power with U.S. Syncrogear Motors. Syncrogear Motors can't slip! Can't misalign! Can't endanger operator! They give you *positive* power delivery in one compact, self-contained package—steady slow shaft-speeds, permanent precise alignment, maximum efficiency and long life. Best of all, U.S. MOTOR dependability! Available in RATINGS ⅓ TO 30 H.P.

U.S. ELECTRICAL MOTORS INC.

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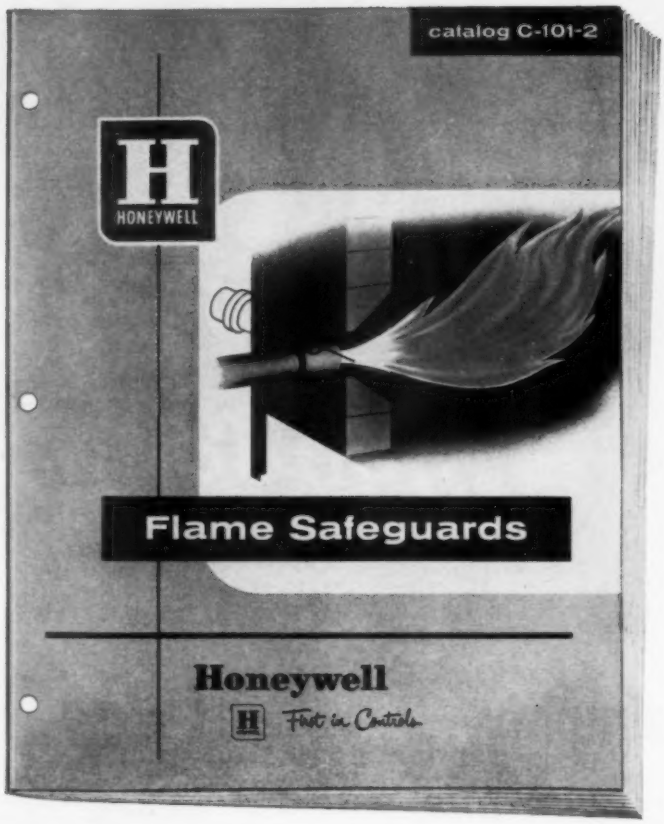
OR MILFORD, CONNECTICUT

SEND FOR FREE 16-PAGE BROCHURE...
illustrated in full color... on U.S. Syncrogear motors.

NEW!
Honeywell Flame Safeguard Catalog...

...describes and illustrates all components—complete systems—for protecting plant, personnel, and product in industrial gas and oil-burning installations.



Send for your free copy today

Protectoglo Relay, one of a complete line of Honeywell flame safeguards

Honeywell Catalog C-101-2 tells you about new, up-to-date flame safeguard equipment for every conceivable type of single and multi-burner installation. It includes specifications and illustrations of every unit, and explains how each operates. Also included is useful information about auxiliary equipment—switches, valves, relays, timers, etc. MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

FILL OUT AND MAIL THIS COUPON

MINNEAPOLIS-HONEYWELL
Wayne and Windrim Avenues
Philadelphia 44, Pa.

Please send me the new Flame Safeguard Catalog C-101-2

Name _____ Title _____

Company _____

Address _____

City _____ Zone ____ State _____

Honeywell

H HONEYWELL *First in Control*

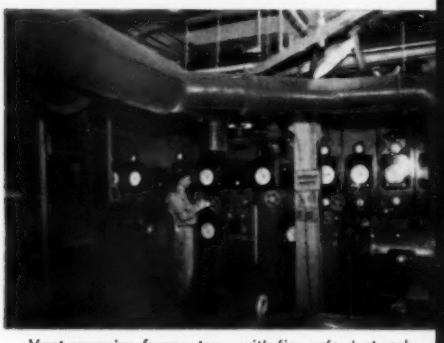
Stop window breakage with flat panes of shatterproof Hetron and fibrous glass. They come precut, install like ordinary glass.

Meet code requirements with a material that's recognized as safe in locations where fire might be a hazard.

Save time on installation with big Hetron-based panels that require no special framing or sash, go up fast because they're so light in weight.

Wash out glare and shadows with light-transmitting areas that relieve eyestrain and fatigue, make your plant more productive.

Remember, not all polyester panels are fire-retardant. Hetron-based panels carry U/L label or Factory Mutual seal of approval.



Vent corrosive fumes, too—with fire-safe ductwork of Hetron-and-glass that outlasts metal, requires little or no maintenance.

These daylighting panels *retard fire*

You can get safer plastic glazing now—with fire-retardant panels made of fibrous glass and Hetron® polyester.

These panels *won't support combustion*—can't contribute to spread of a blaze. They help you keep insurance rates low; meet stiffest code requirements.

At Factory Mutual Laboratories, commercial Hetron-based panels were ignited with a controlled gasoline-vapor fire in a 100-foot-long test building. Roof panels directly above the flames vented in four minutes. Temperatures dropped sharply. The test continued for half an hour—with virtually no further damage to the panels.

Hetron's flame resistance is chemically locked in—resulting in permanent safety. There is no loss of strength, because no additives are used.

These panels *resist corrosive fumes.* They're *shatterproof.* Rocks bounce off them. Blast shock, high winds, severe vibration have no effect on them.

You can get them now from leading fabricators. We make the Hetron resin that goes into them. When you buy, be sure to specify *Hetron-based panels,* or fire-retardant grade.

For a list of fabricators who can supply you, write us now.

DUREZ® HOOKER CHEMICALS PLASTICS

PLASTICS DIVISION

HOOKER CHEMICAL CORPORATION

3907 Walck Road, North Tonawanda, N. Y.

ECON® DUAL-ELEMENT FUSES

INSTANTANEOUS ACTION ON SHORT CIRCUITS
The fusible links open the circuit immediately when a dangerous short develops. The multiple restricted fusing areas cause the heavier sections to drop out in metallic form completely severing the circuit.
TIMED DELAY ON MOMENTARY OR HARMLESS OVERLOADS
Exclusive Econ Alloy thermal element takes harmless overloads up to 500% . . . gives predetermined delay action to avoid unnecessary and costly fuse blows.
IT'S THE EXCLUSIVE ACTION IN ECON'S SUPER SAFETY ZONE that makes the important difference
NO INTERMEDIATE PLASTIC STAGE
When an overload exceeds the predetermined heat and time limits, Econ Alloy reacts instantaneously . . . changing directly from solid to liquid. The usual intermediate plastic stage is completely eliminated. Protecting action is fast and complete with Econ's Super Safety Zone.

with the exclusive Super Safety Zone

- STOP NEEDLESS FUSE BLOWS
- MINIMIZE COSTLY DOWNTIME
- ECON SAVES MONEY ON FUSING
- EXTRA PROTECTION AGAINST BURNOUTS

In Econ's Super Safety Zone you'll find an important difference in action . . . a money saving . . . circuit protecting action that spells lowered costs all down the line.

In this Super Safety Zone, harmless or temporary overloads are carried through an exclusive Econ Alloy Element which delays blowing to a predetermined time limit. When overloads exceed the time limit, Econ Alloy breaks the circuit with fast action. This Super Safety feature costs you nothing extra...Another good reason why it's always extra economy to insist on ECONOMY Fuses.

Available in knife blade or ferrule type from 0 to 600 amperes, 250 and 600 volts. Underwriters' Laboratories listed.

Write for ECON Dual-Element Catalog S-60.

ECONOMY FUSE AND MFG. CO.
2717 Greenview Avenue, Chicago 14, Illinois

ASK YOUR ELECTRICAL WHOLESALER FOR ECONOMY FUSES . . . THE COMPLETE FUSE LINE

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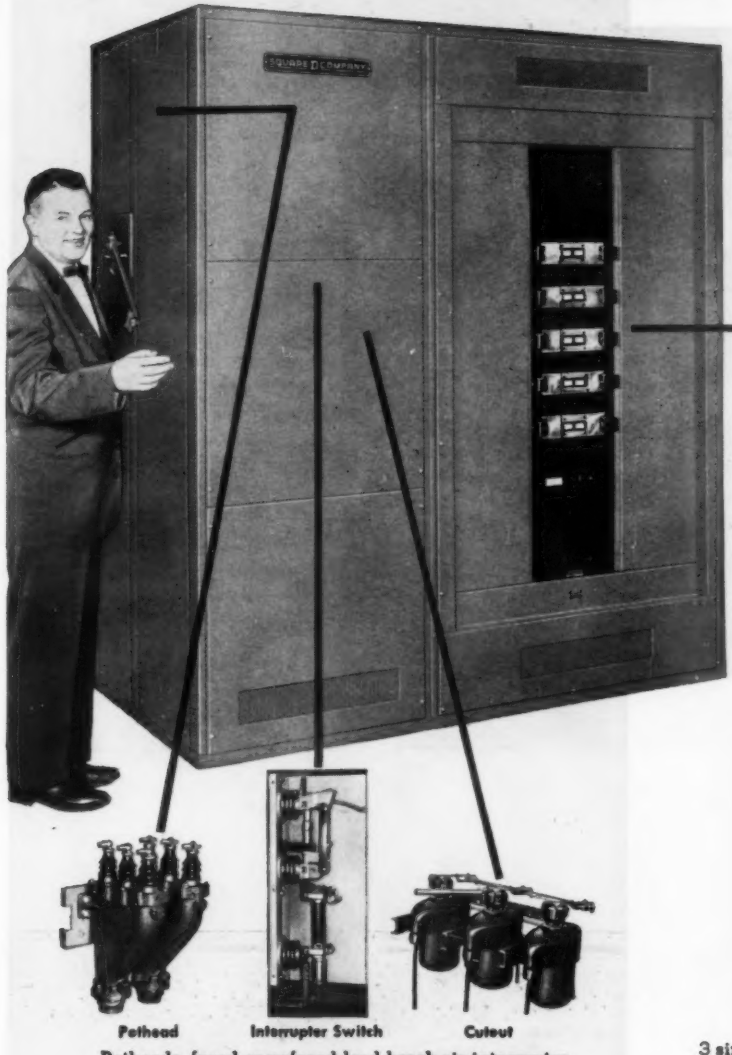
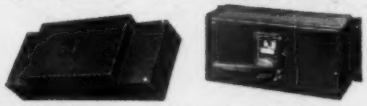
SQUARE D's NEW Unit Substation

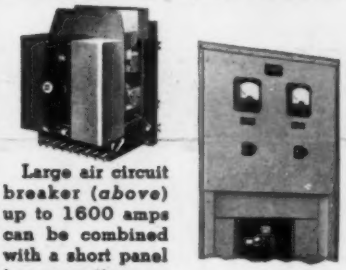
IN POWER-STYLE CONSTRUCTION



Designed to match Square D's Power-Style switchboards and control centers, these new Unit Substations meet NEMA, ASA, and AIEE standards. Available from 75 to 500 KVA; in primary voltages up to 4800V; secondary up to 600V.



Molded case circuit breakers (*left*) up to 800 amperes and QMB Saflex fusible switches (*right*) up to 600 amperes are available in compact panel construction.



Large air circuit breaker (*above*) up to 1600 amps can be combined with a short panel in one section.

Pothead | Interrupter Switch | Cutout

Potheads, fused or unfused load break air-interrupter switches and fused or unfused oil-filled cutouts are available. Air-interrupter switches and cutouts are easily accessible from front of Substation.

REAR VIEW

3 single phase, dry-type transformers individually mounted on base in ventilated enclosure—heating and vibration held to a minimum. Transformers easily accessible for maintenance and inspection. When no air circuit breaker or metering equipment is used, entire area at top left is available for pull box.

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

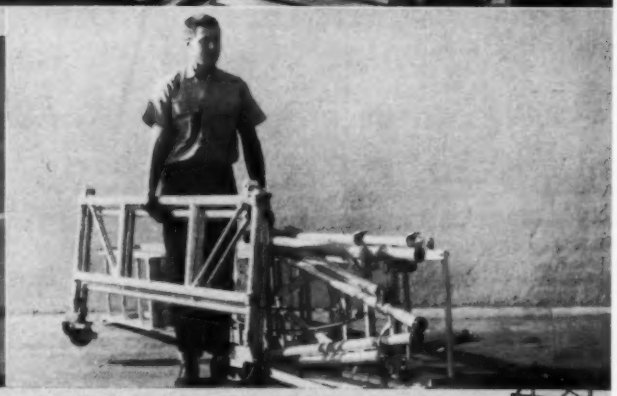
SQUARE D COMPANY

For more facts circle 555 on Reply Card

UP-RIGHT ANNOUNCES

TALLESCOPE ...telescoping aluminum work platform for overhead spot maintenance

Lightweight, rapidly assembled by one man. Extends instantly for reaching heights up to 30 ft. Adjustable legs for uneven floors or stairways. Only 29" wide for rolling through congested areas.



Telescopes and folds down to roll through doorways, under trusses, pipes and conveyors.

Separates easily into 3 components for convenient storage or transportation.

FOR TALLESCOPE CIRCULAR
WRITE TO
UP-RIGHT SCAFFOLDS
DEPT. 179 • 1013 PARDEE ST., BERKELEY, CALIF.

MANUFACTURED BY
UP-RIGHT
SCAFFOLDS

For more facts circle 556 on Reply Card

PROVE IT FOR YOURSELF. CM-OT finish (left), with helically-wrapped corrugated bronze tape, withstands compression to a much greater degree than a Parkway-type finish with a flat metal tape twice the thickness (right).

CM-OT* gives more compressive strength with half the thickness of metal tape

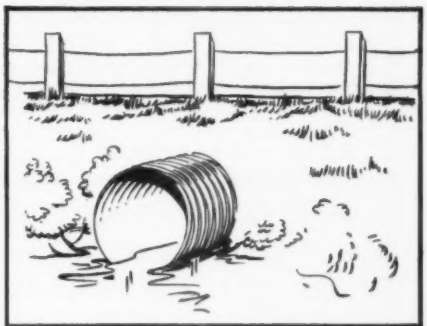
Now you can have a high strength cable covering without resorting to bulky or hard to train direct burial constructions. Okonite CM-OT covering provides a light weight, flexible, small diameter cable of great compressive strength. It offers an excellent combination of installation and maintenance savings for many types of cables—control, communication, power or lighting.

Originally designed for direct burial, CM-OT cables are also readily installed aerially, in conduit, in racks or in underground ducts . . . permitting you to stock one type of cable for many uses.

The corrugated bronze tape that's the heart of the cable covering is permanently bonded to a tough wall of Okoprene, with an Okoprene-filled tape applied overall. This composite covering—bronze plus neoprene—provides a barrier against rodents, termites, moisture, oils or sunlight as well as corrosion by soil alkalies and acids. CM-OT also acts as a two-way cushion and "shield" against the stress of shifting stones and mechanical impact that might damage the vital conductor insulation in service. Electrically, the bronze tape serves as an excellent shield, and "ground" where necessary.

Where your environmental conditions demand different corrosion-resistant properties, CM-PF finish is available with Okoseal (polyvinyl chloride) or Okolene (polyethylene) bonded to the corrugated bronze tape instead of Okoprene. This should be considered particularly where petrochemicals are present.

Flexible . . . easy to handle, splice and terminate—CM-OT is a quality construction you'll find it profitable to become better acquainted with. For the full story, including actual test figures on the samples in the photograph, send for Bulletin PE-1121, The Okonite Company, Passaic, New Jersey.



Corrugation = strength plus lightness
Just as corrugated construction adds strength to underground pipes, so corrugation of shielding tape permits the construction of a stronger, lighter, more flexible and more easily handled cable—CM-OT.

*Patent No. 2722562

***where there's electrical power . . . there's* OKONITE CABLE**

For more facts circle 557 on Reply Card

6130-A

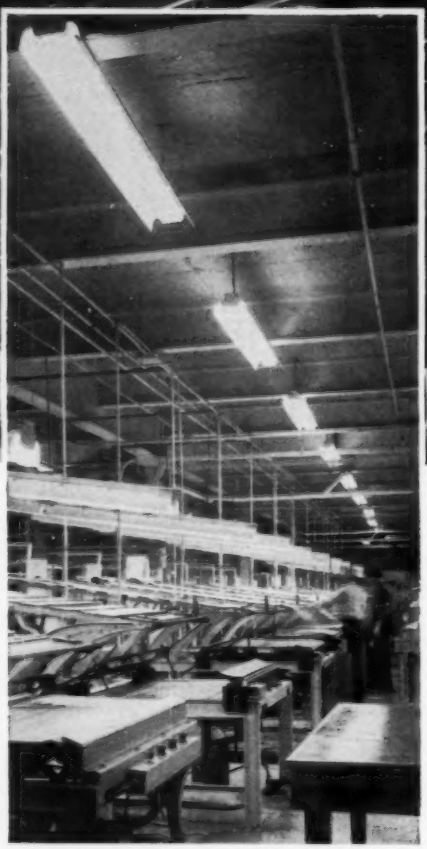
Day-Brite CFI Industrial Fixtures ...start of a great finish

Although the ceiling is almost 40 feet high, Day-Brite CFI-10 (*Comfort For Industry*) fixtures furnish high-level illumination throughout the plant of the Carlisle Finishing Co., at Carlisle, South Carolina. J. E. SIRRINE CO., *Architect-Engineers*, Greenville, S. C.; DANIEL CONSTRUCTION CO., *General Contractor*, Greenville, S. C.; J. FRANK BLAKELY, *Electrical Contractor*, Spartanburg, S. C.

Fundamental to the system of quality and cost controls employed by the Carlisle Finishing Co. is lighting. *Comfort lighting* provided by more than 3000 Day-Brite CFI industrial fixtures.

What does your finished product say about the lighting in your plant? Could higher levels of glare-free, shadowless illumination enable workers to make your product better . . . faster?

Let's talk it over. Call your Day-Brite representative listed in the Yellow Pages.



Four 4-foot lamps in each of 26 Day-Brite CFI fixtures flood hookers with light for critical inspection of goods.

DECIDEDLY BETTER
DAY-BRITE
LIGHTING FIXTURES

Day-Brite Lighting, Inc., 6242 N. Broadway, St. Louis 15, Mo.
Day-Brite Lighting, Inc., of Calif., 530 Martin Ave., Santa Clara, Calif.

Z-252

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

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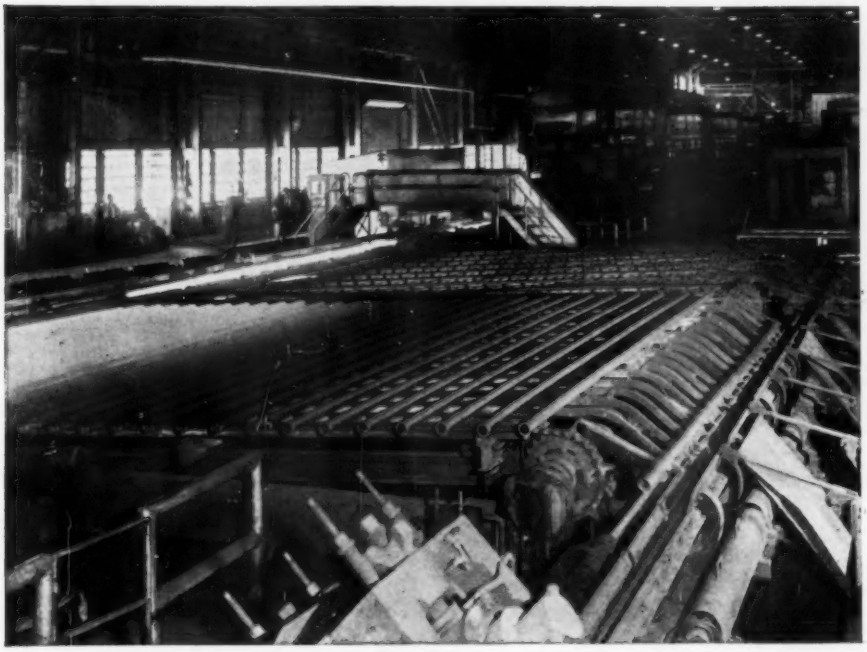
Many industrial operations need the extra qualities of Promal chain



LINK-BELT H CLASS PINTLE CHAIN with pusher attachments on this pipe cooling rack designed by Aetna-Standard Engineering Co. receives white-hot pipe from finishing operations in a continuous butt weld mill. Controlled chain speed permits uniform cooling of outer tube periphery.

Specially heat-treated malleable iron resists heavy and abrasive loads

Fewer conveyor shutdowns and minimized replacements are economies realized by users of Link-Belt Promal chain. Promal will withstand repeated cyclic heating up to 1000° F. Its greater strength absorbs continuous impact loads, and high wear resistance supplies the durability to cope with severe abrasion.

A Link-Belt Development

Promal is more than a partially annealed or surface-hardened malleable iron. Developed by Link-Belt, this specially heat-treated malleable iron is actually transformed into a metal of radically different physical properties. Promal, because of uniform microstructure throughout its whole section, provides greater ultimate strength, higher yield point, exceptional fatigue resistance.

Where and how to apply Promal

Choose Link-Belt Promal chains for highly abrasive or heat-conditions—for extra strength and wear resistance demanded by heavy loads or long sliding conveyors. They last much longer . . . cost but a little more.

The wide range of Link-Belt chains available in Promal includes all types of cast and combination chains.

SMGL-618 PROMAL chain conveyor is another example of the applicability of heat-resistant Promal. This chain conveyor with special joint design and riser attachments picks up and conveys sheet steel through furnace. Chain has operated continuously for two years without failure. The heat-resistant properties of Promal also make it a desirable material for use on low-temperature heat-treating equipment.

PHYSICAL PROPERTIES OF PROMAL

Compare this with other ferrous materials used for chain applications.

Yield Point	55,000 pounds per sq. in.
Ultimate Strength	75,000 pounds per sq. in.
Fatigue Strength	35,000 pounds per sq. in.
Elongation	10 to 14% in 2 inches
Average Brinell Hardness	170 to 190

PROMAL'S high strength factors make it ideal for especially long elevators and conveyors.

HEADQUARTERS for Link-Belt products is your nearby Link-Belt office or authorized stock-carrying distributor. Refer to the yellow pages of your local phone directory.

LINK-BELT

CHAINS AND SPROCKETS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14,823-A

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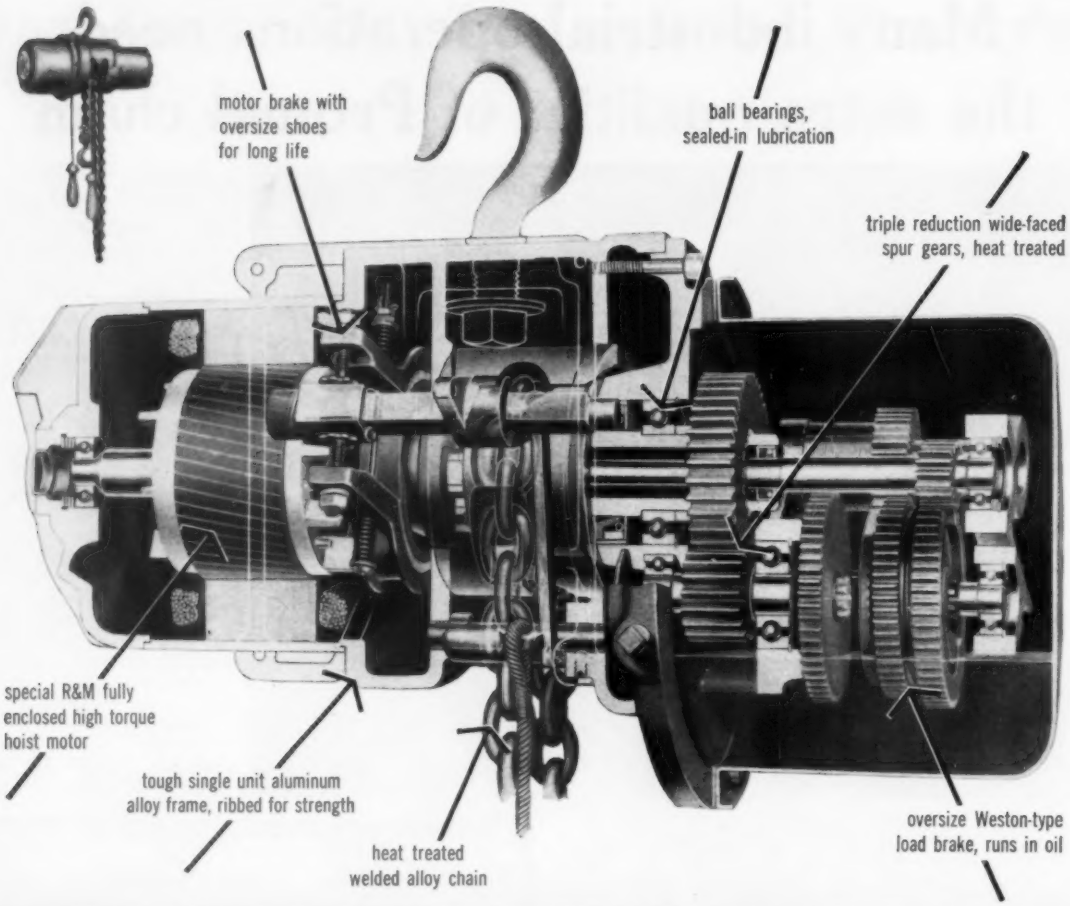


most rugged hoist

R&M JC chain hoists stand up under the most severe industrial service, yet they cost no more. Note the liberal use of ball bearings, the three reductions of precision cut alloy steel gears, and the high-torque R&M hoist motor—highest time rated motor in any hoist of this class (30 min. 55°C). Tough aluminum alloy frame. Gears, Weston-type load brake, and bearings run in splash oil bath. If you built your own hoist for long life, this is the way you'd build it.

Capacities: 500, 1000, and 2000 pounds; Hook mounting and rope control are standard; push trolleys are available for most I beam installations. Ten foot standard lift. *Robbins & Myers, Inc., Hoist & Crane Div., Springfield, O.*

take it up with

ROBBINS & MYERS

holsts cranes

Request Bulletin 852-B today

For more facts circle 560 on Reply Card

COURT DECISIONS —a summary of legal findings of interest to the plant engineer

Prepared by Albert Woodruff Gray

Escalator Clauses

CONTRACT FOR the purchase of structural steel provided, that in the event "prices for component materials" increased or decreased, there was to be a corresponding adjustment of the contract price limited to $15 per ton.

The purchaser insisted that the words "prices for component materials" related to changes in price to the steel company for materials used in progressing the work and increases in prices paid for materials necessary to steel production. On the other hand, the steel company contended that these words referred to the price of steel regularly charged to the trade.

In sustaining the interpretation of the steel company, the court said that if "component materials" means raw materials used in the production of steel, escalation on account of labor rates would not be limited to those specifically mentioned in connection with design, fabrication and erection but would have included labor costs at the mill as well.

"However, it does not," said the court. "The formula employed referred to the computation of 'prices for component materials,' labor rates applicable to the fabrication and erection thereof and freight rates.

"A normal and reasonable meaning of the clause has the word 'thereof' referring to the term 'component materials' so that component materials signify the materials the steel company contracted to provide in performing the work." Court brief 141 N.E.2d 590.

Delivery on Trial

CONTRACT FOR THE purchase of a piston-reamer was made by a purchaser in the state of Washington, but with an oral agreement that it be delivered on trial and be purchased only if it proved satisfactory.

When suit was brought against the purchaser for a recovery of the price agreed upon, defense was based on the oral stipulation that the machine was on trial. This the seller contended could not be done. The sale had been by a written contract and as such the contract embodied, under the law, all the terms of the sale which would be contradicted by this oral stipulation.

In holding the purchaser entitled to interpose this defense of the oral stipulation, the court said, "We think the test is this. If the parties agree that the contract shall not be binding until some event occurs, it is a condition precedent.

"On the other hand, if it is agreed that the contract will cease to be binding if some event occurs in the future, then it is delivered upon a condition subsequent and parol evidence of the agreement would not be admissible because it would vary the terms of and contradict a written instrument. That the purchaser had a right to try out the machine was a condition precedent to a bonding contract." Court brief 317 Pac. 2d 1060.

Catalog Representations

IN THE CATALOG of a Virginia wagon manufacturer was the statement, "We warrant our wagons to be well made, of good, thoroughly seasoned material and of sufficient strength to carry the weight mentioned in our catalog." On the back of the printed order form was, "Should any breakage occur within one year from date of purchase by reason of defective material or workmanship, repairs for same will be furnished at our plant, free of charge, upon the purchaser producing the broken or defective parts as evidence, or an amount equal to the list price of such part less the same discount as is given on this order, will be paid in cash."

These wagons, according to a purchaser, were not up to the standard represented in the catalog. In its defense to the claim made by the purchaser, the manufacturer contended that the only warranty was that endorsed on the order blank.

Awarding damages to the purchaser, the court said of these catalog advertising statements, "All the wagons were ordered upon representations set forth in the catalog and in the catalog they were expressly warranted to be well made. It is certain the purchaser was induced to enter into the contract in question and there is no doubt she had a right to rely upon it." Court brief 19 S.E. 846.

Invention of Employee

EMPLOYED IN THE radio section of the U. S. Bureau of Standards and assigned to research, a scientist, impelled solely by his personal interest in the subject, conceived of the application of alternating electric current in place of battery current in the operation of radio apparatus.

Suit was brought by the Federal Government for a judgment that this invention was the property of the government. Refusal of the United States Supreme Court to grant this contention of the government was based on the statement in its decision, that,

"Though the mental concept is embodied or realized in a mechanism or chemical aggregate, the embodiment is not the invention. This distinction between the idea and its application in practice is the basis of the rule that employment merely to design or to construct or to devise methods of manufacture, is not the same as employment to invent.

"This is an application of equitable principles. Since the servant uses his master's time, materials and facilities to attain a concrete result the latter is in equity entitled to use that which embodies his own property and to duplicate it as often as he may find occasion to employ similar appliances in his business. But the employer in such a case has no equity to demand a conveyance of the invention which is the original concept of the employee alone, in which the employer has no part." Court brief 289 U.S. 178.

Opinions and Facts

TOOLS, DIES and equipment employed in the manufacture of vacuum cleaners, together with cleaners already manufactured and unas-

COURT DECISIONS

sembled parts, were claimed by a purchaser to be unmarketable. Damages for misrepresentations in the sale of this merchandise were set as a defense to an action for the price.

The seller asserted that these machines were absolutely perfect even in the smallest detail, that the water power by which they worked was the most economical method of operation; that the machines were long lived, easily operated and so simple a child of six could use them.

Holding that these statements of the seller gave the purchaser no defense to an action for the price, the federal appellate court said, "These were general commendations, e.g., that the cleaner would produce 18 in. of vacuum with 25-lb water pressure. When the parties are so situated that the buyer may reasonably rely upon the expression of the seller's opinion it is no excuse to give a false one. And so it makes much difference whether the parties stand on an equality. For example, we should treat very differently the expressed opinion of a chemist to a layman about the properties of a composition from the same opinion between chemist and chemist, when the buyer had full opportunity to examine.

"The reason for the rule lies, we think, in this, there are some kinds of talk which no sensible man takes seriously and if he does he suffers for his credulity. It seems to us that general statements as to what the cleaner would do, even though consciously false, were not of a kind to be taken literally by the buyer." Court brief 248 Fed. 853.

Dealer's Responsibility

HEADLINES OF A hardware store advertisement in the St. Louis Post-Dispatch were, "Sensational factory purchase of 'safety first' ladders,' followed by, "In designing our ladders the prime consideration was safety—and that's exactly what you'll find in these splendid ladders."

A customer called at the store, showed a clerk the advertisement and asked to see the ladders and would they be adapted for use in cleaning wall paper. "I think that ladder would be exactly what you want," the salesman replied, adding, "As for strength, they are tested at 200 lb or better." While using the ladder the following day, it broke in two and the purchaser fell to the floor.

In sustaining a judgment against the dealer in the lawsuit brought by this purchaser, the Missouri Supreme Court said, "The seller's privilege to puff his wares, enhance their quality and recommend their value even to the point of exaggeration, is unquestionable so long as salesmanship remains in the field of dealer's talk, commendation or mere expressions of opinion. Particularly do the obligations of warranty not attach when the seller's talk is confined to expression of opinion and not affirmations of fact.

"Also depending on circumstances, assertions on handbills and in advertisements as to the quality or condition of chattels may not, as a matter of law, be construed as warranties and certainly not if they do not become a part of the contract of sale. But the seller's protection lies in the fact that his is the choice of language and action.

"The tendency is to restrict the meaning of the seller's language, especially as to the untruthful puffing of his wares and hold positive statements of quality affirmations of fact." Court brief 186 S.W.2d 603.

Acknowledgment of Orders

CUSTOMERS' ORDERS received by a manufacturer in Illinois were acknowledged by a form statement containing the customer's name and order number followed by shipping instructions and description of the terms and price. Then, stamped in red ink were the words, "This is an exact copy of your order as entered on our books. If not correct please notify. This is not an invoice. Acknowledgment of order only."

Suit was brought by a purchaser for breach of contract. In holding that under these circumstances there could be no recovery by the customer, the court said:

"We consider it a close question whether the manufacturer's acknowledgment of the buyer's order constituted an acceptance. Plainly printed on each acknowledgment was, 'Acknowledgment of order only'. The use of the word 'only' cannot be ignored. Every acknowledgment of the receipt of an order is not in law an acceptance of the order.

"It is not enough that the words of the reply justify a probable inference of assent. While subsequent conduct of the parties may be considered as to whether each party recognized the existence of a contract there is little which bolsters the contention of the purchaser. However that question need not be decided as we prefer to base our decision on the ground that even though the orders and the acknowledgments added up to contracts, they lacked validity for lack of mutuality.

"A contract for the future delivery of personal property is void for want of mutuality if the price is conditioned entirely on the will of one of the parties." Court brief 192 Fed. 2d 93.

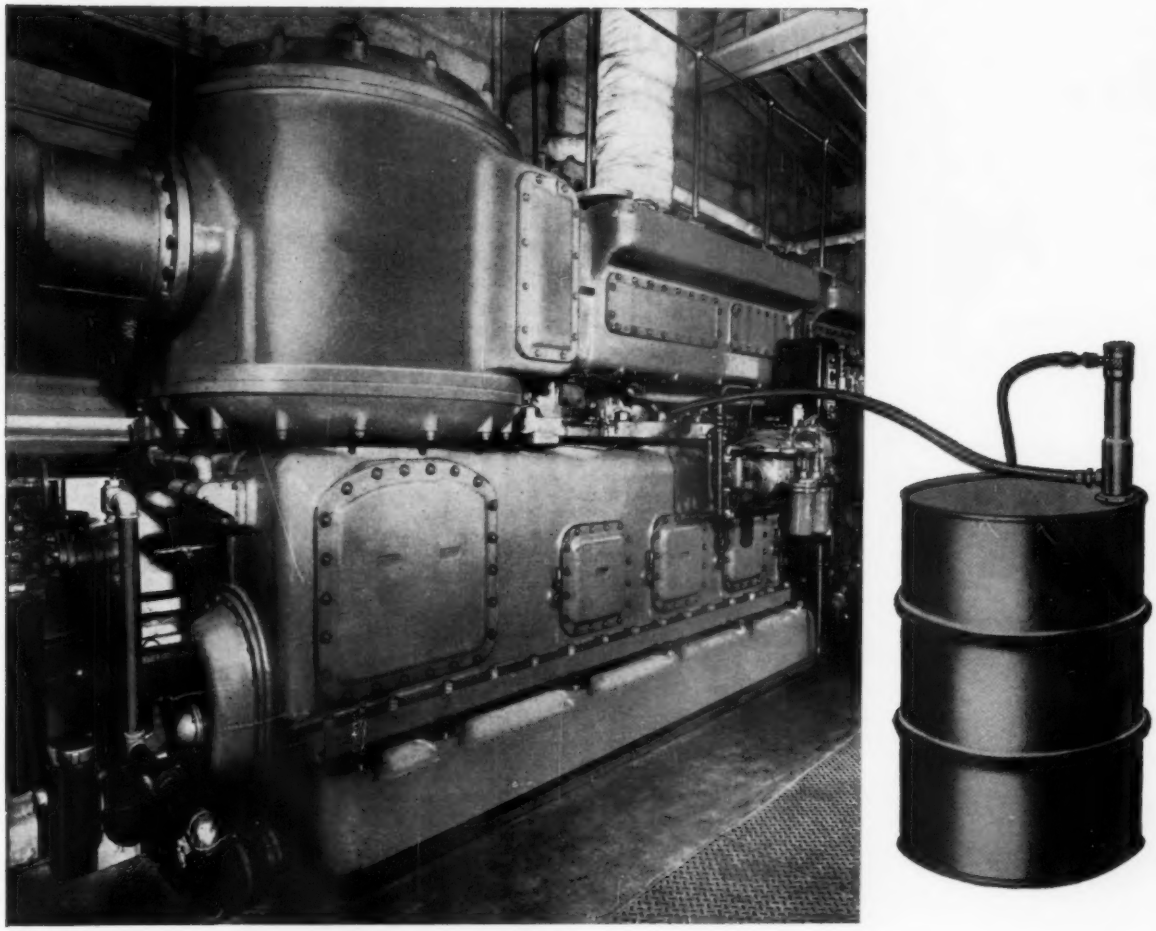
Price Discrimination

WHEN SUIT was brought by a can manufacturer for an unpaid balance due on a customer's account, it was met by the defense that the manufacturer had sold to others at prices that discriminated against this customer in violation of the antitrust laws. As a consequence the can manufacturer had forfeited its right to collect the unpaid balance from this customer.

In its refusal to recognize this assertion of the customer as a defense, the United States Supreme Court said. "When a contract sued upon is not intrinsically illegal, the court has refused to allow property to be obtained under a contract of sale without enforcing the duty to pay for it because of violations of the Sherman Act not inhering in the particular contract in suit and has reaffirmed the doctrine that where a statute creates a new offense and denounces the penalty or gives a new right and declares the remedy, the punishment and remedy can only be that which the statute prescribes.

"The customer's claim to be freed of the obligation to pay his promissory note because the seller made sales to others that when compared with sales made to itself, may be held unlawfully discriminatory, cannot be supported as resting on any congressional word or policy." Court brief 330 U.S. 743.

Varnish Problem Vanishes!



Stop the formation of harmful varnish, sludge and carbon in your Diesels and *keep it stopped* with Sinclair RUBILENE® or RUBILENE HD, the high viscosity index oils proved by over 35 years in industrial Diesel applications. RUBILENE earns its reputation by its performance under continuous operation and heavy loads. It fights deposits and gives better protection to cylinders, pistons, rings and other vital moving parts. Your Diesel stays on the job longer . . . service time is cut 'way 'way down.

Let RUBILENE help solve *your* lubrication problems. Regardless of the make of your Diesel, there's a member of Sinclair's RUBILENE or RUBILENE HD family that meets your requirements. Call your local Sinclair Representative for further information, or write for free literature to: Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation!*

Dino, the Sinclair Dinosaur, says:

"Send *now* for free literature on RUBILENE!"

SINCLAIR RUBILENE® OILS

For more facts circle 561 on Reply Card

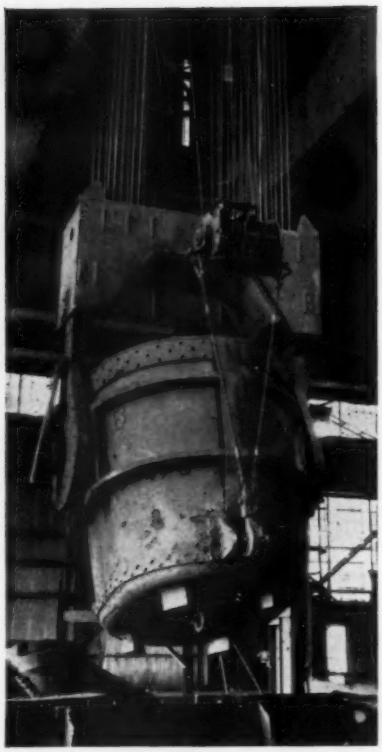
"Easy Does It" When Tuffy Slings and Hoist Lines Tackle the Toughest Jobs

Tuffy Slings swung the "hefty" parts of this huge hydraulic press into position and then handily picked up the whole assembly to load it out for delivery. The secret of the amazing strength of all Tuffy Slings is their special purpose steel and the way it's machine-braided to give a combination of toughness and flexibility you won't find in any other sling.

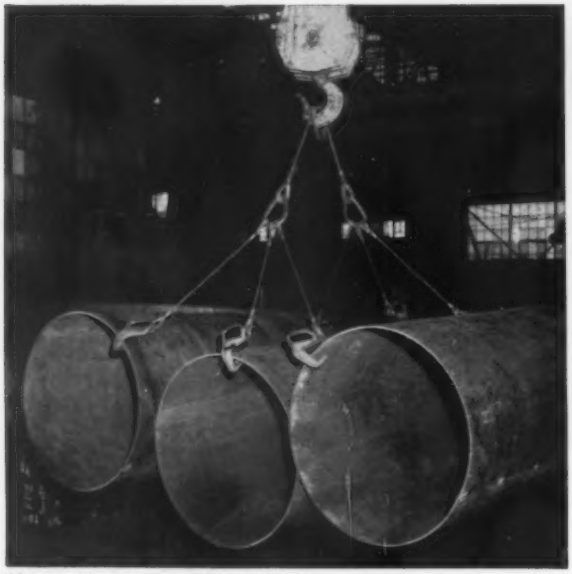
Wire rope performance isn't just a matter of strength. Regular-construction wire rope such as the Union 6 x 19 or 6 x 37 will give you the strength you need. But it makes an ornery kind of sling — stiff to handle, quick to kink and loop, subject to serious damage when bent around small radii and sharp corners.

Tuffy gives you the strength you need — perfectly balanced with flexibility, toughness and other properties slings and hoist lines must have for top performance and longest service life. And Tuffy's pressed-on ferrule, applied under tremendous pressure, gives the eye-splice 100% of fabric strength.

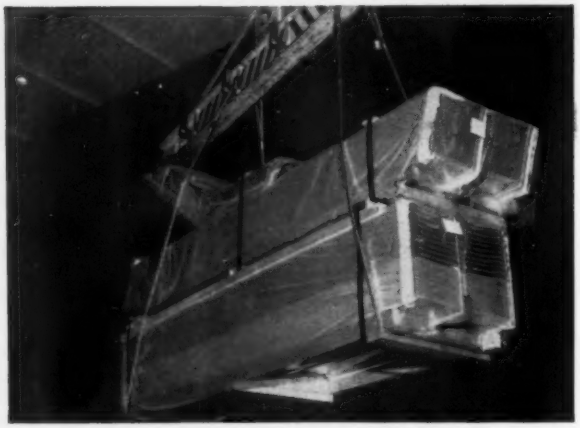
Get in touch with your Tuffy Distributor! He'll help you save money with the longer, trouble-free life of Tuffy Slings, Hoist Lines and other Union Wire Ropes. Whether it's an emergency need or a scheduled replacement, he is stocked to give you fast service.



Tuffy gives steel mill TWICE the service! Quoting a giant steel corporation: "We are getting double the service life from our 1¼" Tuffy Slings as we did from 6 x 37 type slings." Reason: ideal balance of strength and flexibility in Tuffy Slings. Pictured: Huge ladle, pouring tons of molten steel into furnace, is handled by a 1¼" Tuffy Sling and two 1⅛" Tuffy Hoist lines.



Three ride where one rode before! A Canadian iron works makes tanks on production-line basis. Plate steel is rolled into 8'-long tank sections, then transported by overhead crane to final assembly point. The sections used to ride suspended on a chain — one section per trip. A better idea was presented. Now a rigging of U-9 Tuffy Slings with pipe hooks handles all three sections of a tank in one crane trip.



Buildings aweigh! One of the nation's largest makers of prefabricated steel buildings speeds up production with Tuffy Slings. High flexibility makes Tuffy Slings conform perfectly to irregular load contours, hug sharp corners and snug down smoothly in a basket hitch. Handling and rigging time are cut to the bone.

union Wire Rope corp.

SUBSIDIARY USS STEEL CORPORATION

2272 Manchester Ave. **Kansas City 26, Mo.**

Specialists in high carbon wire, wire rope, braided wire fabric, stress relieved wire and strand.

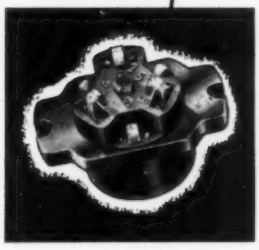
For more facts circle 562 on Reply Card

"THE MOTOR IS PROTECTED AGAINST OVERLOAD BY BUILT-IN THERMOSTATIC PROTECTION"

KLIXON

MOTOR PROTECTORS guard against costly burnouts in GOLF SILENTIUM pumps made in Denmark

KLIXON TYPE CW THREE-PHASE PROTECTOR



The factors which cause overheating in single and three-phase motors are the same everywhere and lead inevitably to the same destructive result unless controlled. That is why you'll find progressive motor and equipment manufacturers the world over specifying KLIXON Inherent Overheat Protected Motors.

The H. HOLLESENS Pump Works of Copenhagen, Denmark, long a user of KLIXON protected single-phase motors, is the first manufacturer in Europe to specify KLIXON three-phase inherent protectors in its product line.

Here's what Manager, Jørgen Aabye, says:

"In our silent circulating pumps for central heating, for garbage grinders and domestic water supply systems, we have for years guarded against motor burnouts with KLIXON *Protectors — first in single-phase motors — now also in our three-phase equipment. The results have been excellent."*

You, too, can get maximum overload capacity with dependable overtemperature protection in the motors that operate your equipment — just specify and use KLIXON inherently protected motors. Write now for the details on KLIXON Inherent Protectors for single-phase and polyphase motors . . . new bulletin PR 1243 available on three-phase motor protection.

METALS & CONTROLS CORPORATION

Spencer Division 4507 Forest Street, Attleboro, Mass.

KLIXON®

For more facts circle 563 on Reply Card

Where a misstep costs $500... Blaw-Knox Electroforged® Steel Grating provides safer non-slip footing

Stair falls cost industry over $60,000,000 a year.

An average accident amounts to a loss of $500 in claims.*

A good way to guard against these profit-eating accidents is to construct your stair treads, walkways and floors with Blaw-Knox Electroforged Steel Grating. Non-slip twisted crossbars and a wide variety of bearing bars are available to meet every kind of working condition—safely solving the most hazardous skid situations.

Rigid, one-piece construction makes installation easy. Once on the job, Blaw-Knox grating practically takes care of itself. There is nothing to wear, nothing to patch, no dirt collecting corners to clean. It goes anywhere, fitting neatly around pipes, beams and machinery, admitting plenty of light and air to the area.

Made to your specifications, Blaw-Knox grating provides new highs in safety, easy up-keep and flexible application. For new ideas about grating—including space saving platforms and shelving, write for Bulletin 2486.

*Based on a study analyzing 803 compensable work injury claims closed in Illinois involving stairs and steps.

BLAW-KNOX

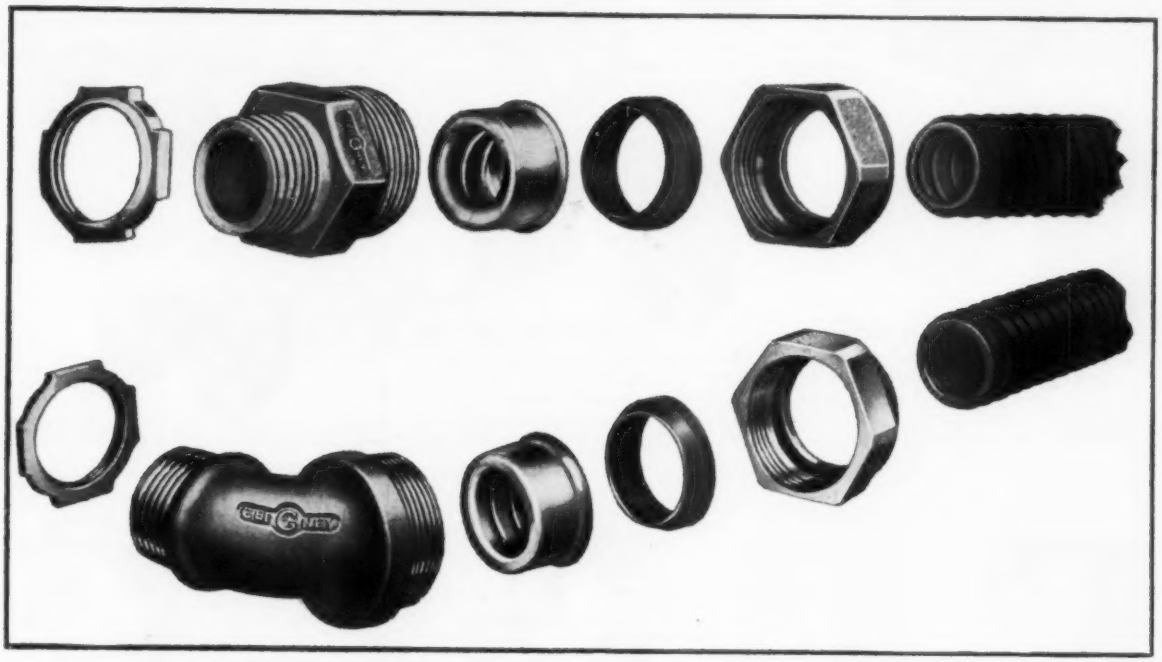
BLAW-KNOX COMPANY

Equipment Division
Dept. H, Pittsburgh 38, Pennsylvania

For more facts circle 564 on Reply Card

For absolutely Liquid-Tite Connectors specify

GEDNEY— every time!



THESE ARE THE NEWEST, most efficient liquid-tite connectors available today for use with Sealtite* and equivalent liquid-tite conduits. Designed to give wiring installations absolutely dependable protection in these popular oil- and water-tight flexible raceways, Gedney Liquid-Tite Connectors are built for lifetime service.

As shown from left to right in the exploded views above, Gedney Liquid-Tite Connectors consist of:

1. **Locknut—nut stock steel—cadmium-plated**
2. **Main Fitting—straight, 90° angle, or 45° angle—malleable iron—cadmium-plated**
3. **Grounding Bushing—one piece—threaded to engage conduit spiral**
4. **Molded Vinylite sealing ring—pliable—ever-lasting**
5. **Gland Nut—malleable iron—cadmium-plated**

Standard sizes range from ⅛" to 2" straight, 45° and 90° . . . order Gedney Liquid-Tite Connectors for top safety and longest life.

* *Sealtite is the trade name of American Metal Hose Branch of the American Brass Company*

GEDNEY FITTINGS FIT!

GEDNEY
ELECTRIC COMPANY

GEDNEY

RKO BLDG., RADIO CITY, NEW YORK 20
Foundry, Factory and Shipping Point: Terryville, Conn.

For more facts circle 565 on Reply Card

BASIC MODELS

Model 640—Unit Bench

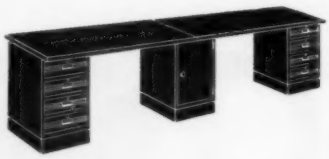
One bench top (steel, Presdwood-covered steel, laminated wood or ShopTop). One 4-drawer pedestal unit. One cabinet unit with adjustable shelf. Two bases.

Model 643—Unit Bench

One bench top (steel, Presdwood-covered steel, laminated wood or ShopTop). Two 4-drawer pedestal units. Each drawer glides on roller bearings, has individual cylinder lock and flush pull. Two bases.

Model 646—Unit Bench

One bench top (steel, Presdwood-covered steel, laminated wood or ShopTop). Two cabinet pedestal units. Each has adjustable shelf, chrome plated locking handle. Two bases.



Space Engineering with Standard Hallowell Shop Equipment

Typical installation of HALLOWELL unit work benches. They can be set up in continuous line, back to back, or singly in shop, lab, toolroom or on assembly line.

makes it easier, faster and more economical to outfit an area and rearrange it to meet changing requirements

Space engineering with standard HALLOWELL Shop Equipment overcomes all the disadvantages of specially designed and custom-built equipment. Its cost is only a fraction that of custom-built units. It is easy to order and get from leading shop equipment dealers; can be set up fast; can be quickly rearranged to meet changing requirements; and is extremely versatile. Standard HALLOWELL interchangeable accessories (backboards, end pieces, top shelves, wire-mold sections, electrical panels, testing panels, and storage wall units) can be added as needed to increase the usefulness of this equipment.

Ask the authorized dealer nearest you for complete information on the standard HALLOWELL line of work benches, shop desks, stools and chairs, tool stands, cabinets, storage walls, shelving. Write Columbia-Hallowell Division, STANDARD PRESSED STEEL CO., Jenkintown 26, Pa.

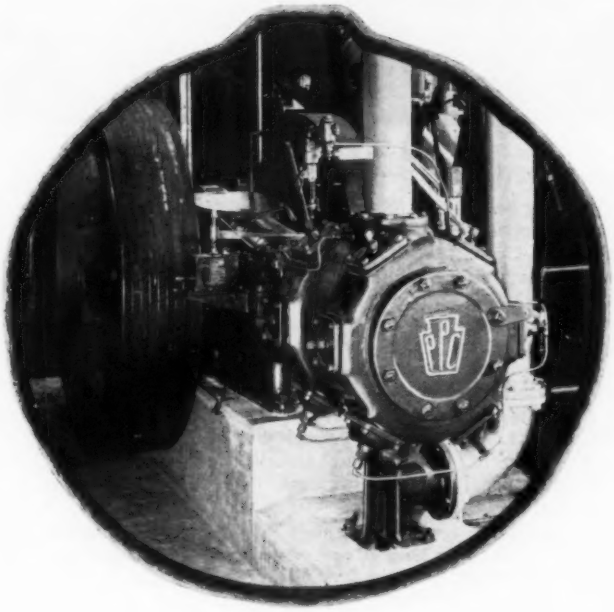
SPS **Jenkintown • Pennsylvania**

Standard Pressed Steel Co. • The Cleveland Cap Screw Co. • Columbia Steel Equipment Co. • National Machine Products Co. • Nutt-Shel Co. • SPS Western • Standco Canada Ltd. • Unbrako Socket Screw Co., Ltd.

For more facts circle 566 on Reply Card

*with this valve

COMPRESSOR OPERATES 44,000 HOURS WITHOUT REPLACEMENT PARTS



Forty-four thousand hours of continuous service! This Pennsylvania Compressor has operated 16 hours per day, seven days per week for over seven years without replacement of a single part. The piston has traveled 274,000 miles. The valve discs have seated 790,000,000 times. Consider what this kind of dependability means to production, to say nothing of eliminating maintenance costs.

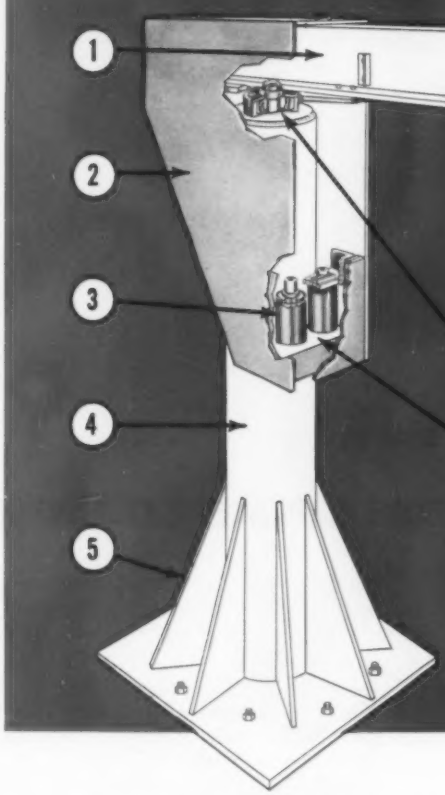
Reports such as this are commonplace at Pennsylvania. There's a Pennsylvania Compressor to match the job you have. Write today for the brochure COMPRESSORS FOR INDUSTRY, describing Pennsylvania Compressors from 10 to 350 hp.

***With this valve,** every Pennsylvania Compressor provides outstanding service. It's the Air Cushion Valve which is constructed entirely without nuts, bolts or screws to work loose or burn fast. Stainless steel valve discs lift against a soft cushion of air . . . there is no metal working against metal. Life is prolonged, maintenance diminished. Valve can be assembled or disassembled in seconds. Inlet and discharge valves are interchangeable.

PENNSYLVANIA
PUMP AND COMPRESSOR CO.
Easton, Pa. • Earning Customer Confidence Since 1920

For more facts circle 567 on Reply Card

move loads easier...



ON CHICAGO TRAMRAIL JIB CRANES

EXCLUSIVE!
2-Point Floating Suspension Makes the BIG DIFFERENCE in Efficiency

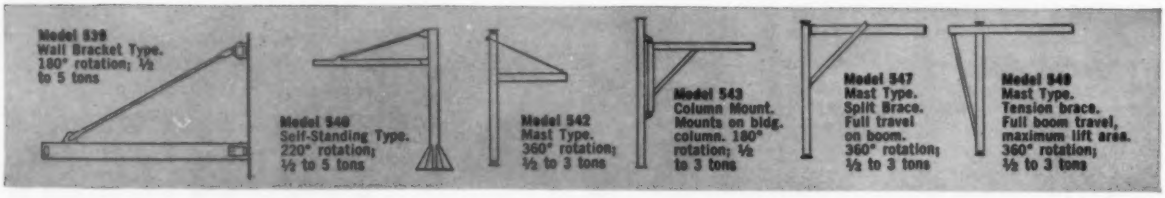
1. **High carbon, hydraulically straightened Beam designed to accommodate heavy duty electric hoists.**
2. **Rigid box construction to insure minimum deflection.**
3. **Bottom roller assembly adjustable for leveling boom.**
4. **Heavy seamless steel column.**
5. **Numerous heavy steel gusset plates welded to column and base provide accurate alignment between column and base.**

Free and easy boom swing is a designed-in characteristic of every Chicago Tramrail Jib Crane. For example, the 2-point suspension used in the Model 541 Jib Crane literally floats the boom through its 360° swing — makes heavy load handling a fast, easy job.

Two bottom load carrying rollers, equipped with heavy duty precision ball bearings, engage and bear on the surface of the vertical column; the top bearing is a precision radial and thrust bearing. This combination assures minimum drag and free boom rotation.

All structural and mechanical parts of Chicago Tramrail Jib Cranes are designed to withstand loads which include heavy duty electric hoists and 25% impact. Every detail of these cranes is designed and built to insure fast, efficient, and safe load handling. That's why you see more Chicago Tramrail Jib Cranes at work . . . and more being installed every day.

Chicago Tramrail Jib Cranes are made in more than 12 types; capacities to 7½ tons, spans to 22 ft., with heights and mounting details to suit your application. Write for complete Jib Crane Catalog.



CHICAGO TRAMRAIL CORPORATION
1324 S. Kostner Ave., Chicago 23, Ill.

For more facts circle 568 on Reply Card

What's Just Ahead in This Issue?

- PLANT costs on a construction or maintenance project can get out of hand without proper control. To keep a constant check on such projects, a cost control system, employing seven forms, is used by Western Electric's Tonawanda plant. Turn the page to see how this system may help you.

- THERE'S a lot of difference between unorganized talking (or just plain mouthiness) and a planned, intelligent presentation of facts and figures, including dollar signs. When you as the plant engineer are getting general management to agree on a sizable expenditure of company funds for a plant engineering project, do it properly. The author gives a lot of good tips on how to organize, present and sell any project. See page 90.

- IS NEW lighting possible without a capital appropriation? Yes, you too can improve your plant and office lighting without spending one cent of capital. If you want to find out who foots the bill, turn to page 93.

- HOW to get all employees in on the act when you're putting across a plant safety campaign is the subject of the article "Study, Not Snooping, Humanizes Safety," that begins on page 95. In a highly hazardous industry, this company has cut its accident frequency rate from a high of 23.34 to the irreducible minimum of 0.00—just two years after initiating their "Committee of Everyone" policy.

- AMPLIFYING weak control signals generally requires complicated electronic circuitry and associated maintenance problems. How a simple electro-mechanical torque amplifier solves these problems is outlined in the article starting on page 97.

- AIR tools and air controls do not "foul up" as they previously did at GE's Appliance Park. The answer was a centralized dry compressed air system. To find out about this system and how it has paid its way in a year's time, turn to page 100.

- HOW skilled are your electricians at bending tubing? Do they use a bend-and-try method or are they systematic about their procedure? Planning can save time and material and take some of the strain from the budget. Besides, chances are that the finished jobs will look better. For some tips on bending metallic tubing see pages 110 and 111.

- BETTER welds by better weldors—that's what Kenworth Motor Truck Company had in mind when it outfitted a weldor testing booth. Training, testing and proper recognition of each weldor's qualifications have improved both product and morale. Have you got weldor problems? See page 118.

Controlling Costs on Plant Orders

Seven Forms Keep Accurate Check on Material and Cost Estimates

By R. J. DETUNO, Plant Engineer, Western Electric Co., Tonawanda, N. Y.

AN ENGINEER-CENTERED "plant order cost control system" has recently completed its third year of successful trial operation at our Tonawanda, New York, plant.

Tailored to this 786,000-sq ft plant, and to a staff of 10 plant engineers, the plan combines long-standing accounting procedures with new controls to sharpen material and cost estimates and reduce over-runs. During the trial period, over-runs on the construction and maintenance work of our 100 employee-tradesmen have shrunk to zero.

Auxiliary benefits include:

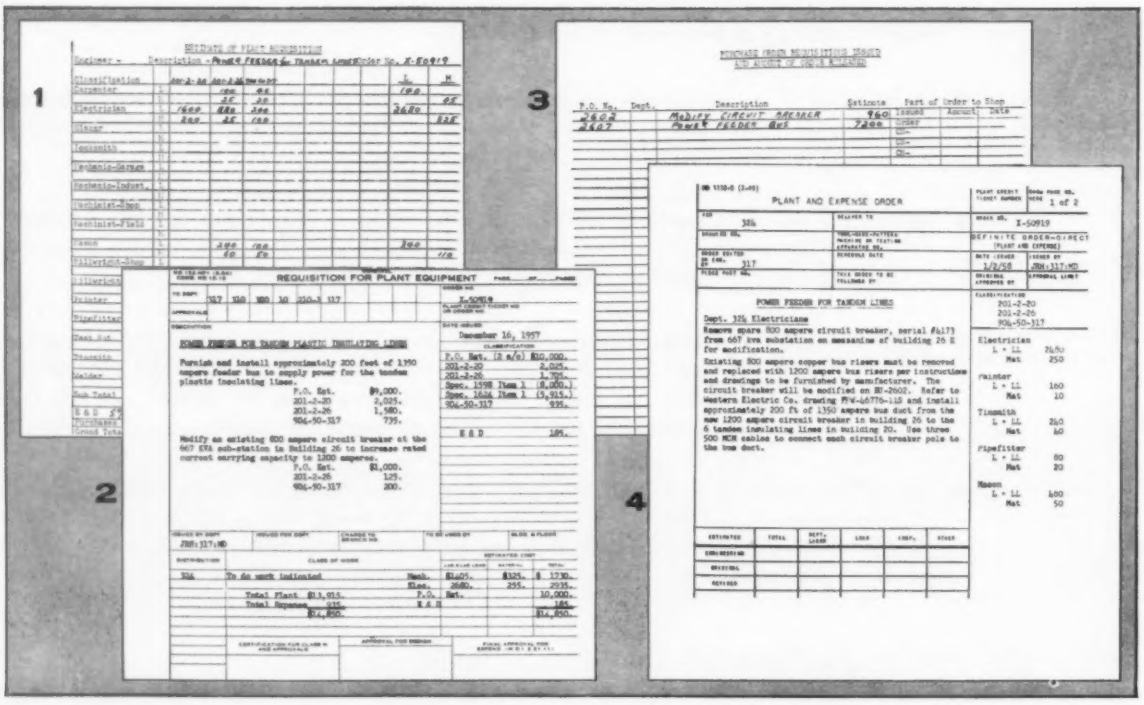
1. More accurate charging of labor and materials from an accounting and investment standpoint.
2. Increased management confidence in expenditure estimates.
3. More factual basis for construction and maintenance program planning.
4. More efficient over-all use of skilled manpower within a framework of accurate time estimates.
5. Improved material stock levels, largely eliminating shortages and facilitating consistency of purchasing.

We do not consider the set of procedures explained below to be wholly applicable to plants of other industries. Factors such as size of plant, number of plant engineers, whether employee- or contractor-tradesmen are used, nature of materials contracts, and accounting procedures all dictate wide variations in operation. However, the system we have developed contains a number of steps applicable to a broad range of plant order cost control problems.

The following outline shows how we use the plant order cost control system:

When the plant engineer receives a request for services, he analyzes the job and breaks down the work by accounting classification and the plant trades involved, using the form "Estimate of Plant Requisition," Form 1. This form and the other

Forms 1 through 4. These four forms record the estimate of order, requisition of equipment, purchase order approval and a report regarding the amount and kinds of shop work which will be required to take care of the over-all project



forms on these pages will show you how each is used on a particular job. In this case, the project is to install a power feeder for tandem plastic insulating lines.

This form assists him in making a more accurate estimate of the work involved. It also helps to eliminate the tendency on his part to make snap judgments when estimating work to be performed and determining the class of work for accounting purposes.

He next prepares a "Requisition for Plant Equipment," Form 2, which gives a brief description of the job and a breakdown of the expenditures by classification. This requisition is sent to our accounting organization which certifies that the classification is correct. Then it has to be approved for design and expenditure.

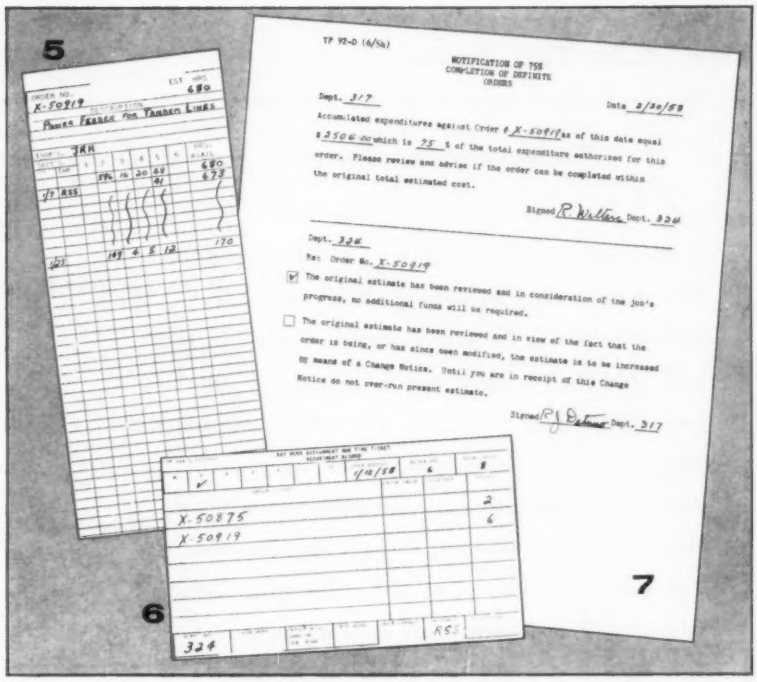
When the necessary approvals have been obtained on the requisition it is returned to the plant engineer, and the design organization is requested to prepare the necessary drawings for the shop. The plant engineer obtains an order number, releases the requisition to the Accounting Department, which issues purchase orders for all equipment and material not regularly stocked.

These purchase orders are listed on the reverse side of "Estimate of Plant Requisition," Form 3. A cumulative total of these purchase orders gives him a check on material expenditures as the job progresses.

Plant and Expense Order

When the drawings are prepared and the equipment and material ordered, the plant engineer issues a "Plant and Expense Order," Form 4, which will apply to the requisition. The Plant and Expense Order contains a detailed account of the amount and kinds of shop work which will be required.

Copies of the order with drawings for each trade involved are sent to the Plant Services Department. There are copies for each trade, one for the tradesman and one for the supervisor. An extra copy is provided for the department file. It shows the amount of money allotted to each trade, and this copy is routed to the record clerk of the Plant Services Department.


5
ORDER NO. X-50919
EST. HRS. 680
DESCRIPTION Power Feeder for Tandem Lines
6
324
7
TP 92-D (6/54)
NOTIFICATION OF 75% COMPLETION OF DEFINITE ORDERS
Dept. 317
Date 2/20/58
Accumulated expenditures against Order # X-50919 as of this date equal $ 2506.00 which is 75 % of the total expenditure authorized for this order. Please review and advise if the order can be completed within the original total estimated cost.
Signed R. Williams Dept. 324
Dept. 324
Re: Order No. X-50919
The original estimate has been reviewed and in consideration of the job's progress, no additional funds will be required.
The original estimate has been reviewed and in view of the fact that the order is being, or has since been modified, the estimate is to be increased by means of a Change Notice. Until you are in receipt of this Change Notice do not over-run present estimate.
Signed P. J. Peterson Dept. 317
1/21/58
X-50875
X-50919

Forms 5 through 7. These forms keep track of trade labor hours required, record of work hours performed and notification of 75 per cent completion of orders

The tradesman's copy of the order does not indicate the amount of money allotted, because we have found that there may be a tendency for the tradesmen to pace their efforts so as to consume the amount of time allotted, if they know what the allocation is.

The record clerk prepares a card showing "Time Charges to Plant and Expense Orders," Form 5. The amount allotted to each trade for labor is converted into hours on this card, the conversion being made using the charge rate for the department.

Total hours are shown on the line below the trade designations, which are numbered 1 to 6. On the following line, a figure is entered representing the number of labor hours remaining when 75 per cent of the allowance is used. This is done for each trade and for the total. The card is then posted in a rack in the department office.

At the end of each day, each tradesman turns in a record of his time on the "Day Work Assignment and Time Ticket," Form 6, accounting for his full tour of duty.

At the beginning of each day, the record clerk posts the time charges of the preceding day on the card, Form 5, and keeps a cumulative total. *Herein lies the success or failure of this or any other set of controls.* If several days were allowed to elapse before posting time charges, many of the smaller jobs would be over-run before corrective action could be taken.

75 Per Cent Complete

Upon reaching the point where 75 per cent of the time allowed has been charged, the record clerk immediately notifies the trades supervisor, and he reviews the job to determine if the work can be completed in the remaining 25 per cent of the allotted time. If, in his opinion, the job can be completed within the time allowed, no action is taken.

However, if he feels the job cannot be completed in the time remaining, he originates a "Notification of 75 per cent Completion of Definite Order," Form 7, and sends it to the plant engineer who originated the order. The plant engineer then reviews the job and returns the lower part of the form to the trades supervisor, indicating the action to be taken.

Perhaps you are wondering why we allow 75 per cent completion

(Continued on page 194)

First, Take This Test —

When selling a project to general management do you believe:

	YES	NO
You should blueprint your talk beforehand?		
You should start by telling a joke or a story?		
You should tell them how long you plan to talk?		
You should give your talk a mysterious title?		
You should give your talk a revealing introduction?		
You should memorize your talk?		
You should use notes to remember your talk?		
You should use pictures, charts, graphs, etc.?		
You should display plenty of supporting data?		
You should use plenty of forceful gestures?		
You should demand immediate decision?		

To Sell a Plant Engineering Project . . . Speak Effectively

By **BURKE W. WOMBACHER**, Plant Engineering Consultant, Redondo Beach, Calif.

PLANT ENGINEERS are constantly faced with the problem of selling; selling management on preventive maintenance, new construction and equipment, new trends and ideas, etc.

Some plant engineers are highly successful in their selling efforts, with the result that their companies benefit and prosper through their efforts. Others are also successful in varying degrees, on down to those who are admittedly failures at selling.

This failure group at one time included me, but I'm happy to say it doesn't any longer. I was always "mouthy" and voluble, and had plenty of technical knowledge, but somehow it seemed that I scored too many misses in selling my ideas. Fortunately, I found the difference between just talking and communicating my ideas effectively.

In other words, many plant engineers with tremendous potentials, fine technical knowledge, and leadership abilities, are not in their rightful position among the ranks of general management because they lack the ability to communicate their ideas effectively.

The most carefully engineered and planned program will fall flat on its face with management if the plant engineer does not sell it to them correctly. Any such planned program must also include a selling program, and be communicated in such a way as to "get through" to management.

There are many ways to communicate our ideas:

By visual communications through such mediums as pictures, charts, graphs, samples, data.

By appeal to the senses of touch, taste, feel, etc.

Verbally through speech or discussion; or by the written word.

Of these many ways to communicate, there is no doubt that speech is the most effective. So, a plant engineer must learn to speak effectively if he is going to sell effectively.

General management finds its time becoming more limited. It must fight to keep abreast of the rapid technological advance being made in order to remain competitive. They must make more and more decisions, and make them rapidly and correctly, while at the same time choosing wisely from the many proposals and ideas submitted.

What Are the Qualities of a Good Speaker?

Are you speaking effectively? Before reading further, fill in the check chart shown at the top of the opposite page and then let's see if we agree. Here is my concept of what determines speech effectiveness as it applies to selling any engineering project to management.

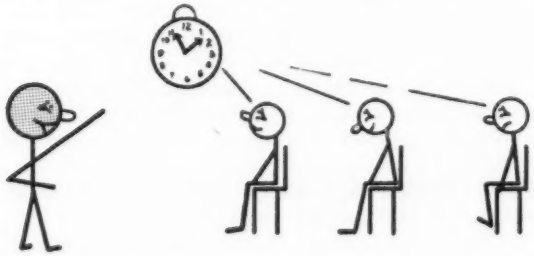
First we must recognize that when we are making a presentation of a plan to management we are not speaking to a large general audience. Of course, some of the same rules will apply. We will follow the check chart items on the facing page and discuss each of them briefly.

Now, Check Your Answers to the Questions on Opposite Page

Blueprint your talk beforehand. Yes. Even more carefully than you would draw plans for a new building, you should draw plans for your presentation. Building plan errors can be corrected by field changes, but your presentation allows for no such second chance.

Start by telling a joke or story. No. Nothing can get you off to a worse start than a bum joke or story. Unless you are a natural born humorist and know your management will appreciate it, let it alone. Remember you are there on business; be businesslike but natural.

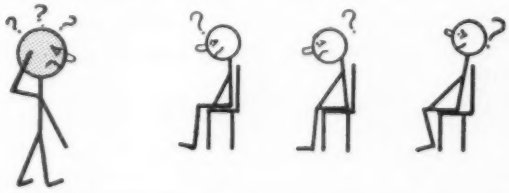
Tell them how long you plan to talk. Yes. By all means tell them how much of their time you intend to take for your presentation. They probably had to leave something they were doing to attend your meeting, and would probably be much happier elsewhere. Knowing the time that they will "lose" will help them adjust to the fact.



Give your talk a mysterious title. No. Sometimes speakers will use a mysterious, provocative title to captivate an audience, but don't try it with management men. These fellows are practical and they are after facts, not mystery stories.

Give your talk a revealing introduction. Yes. Don't keep them in the dark. Tell them right away the end result to be expected, and they will follow the line of your talk all the way with their thinking adjusted to reach the same conclusion.

Memorize your talk. No. Unless you do it easily, don't do it. You shouldn't need to if you have done a good job of blueprinting your presentation in the first place. Usually a memorized talk sounds memorized and is not effective.



Demand immediate decision. No. If you properly blueprinted your talk there will be no need for demanding decision; it should come automatically. Your whole presentation should lead to forming their decision so that all you need is a confirmation of your judgement, without any need for debate or conference for determination.

Use notes to remember your talk. Yes. Use all the notes you want and don't even try to be unobtrusive about it. There is no shame in using notes; management will appreciate that you have done some preplanning, and are not just "sounding off."

Display plenty of supporting data. No. It is well to have such material to answer a question, or prove a point, but don't try to use it as a weapon. Remember you want management to have confidence in you, and you shouldn't expect them to make you prove everything you say.

Use pictures, charts, graphs, etc. Yes. By all means use them if they are supporting to your presentation. However, it is best to keep them concealed until they are needed, and again conceal them after they have served their purpose. Such eye catchers will detract from you if they are openly displayed. People's eyes and minds will automatically dwell on them and try to figure them out before you come to them.

Use plenty of forceful gestures. No. Flapping your wings, beating the table to pieces, and other such violence is out of place here. But don't be stilted either; easy, natural motions are expected of you. The most effective gesture is the pointed finger. Pointing at a person brings him to a direct line contact with you. The eyes automatically will follow a pointed finger. Watch out where you point; don't make them look at the ceiling.

One Way To Sell a Maintenance Program

Here is a sample speech outline that includes the key factors of presentation effectiveness:

Time and title. This meeting will take about ten minutes, and the subject will be productive maintenance.

Introduction. The purpose of this meeting is to bring to your immediate attention a new plan for reducing total product costs through a productive maintenance program. We have developed a carefully engineered program that will act in many ways to reduce production costs.

Productive maintenance has four main goals:

1. Restore all equipment to peak operating condition.
2. Maintain at peak through preventive maintenance program.
3. Reduce costs of production, and costs of maintenance.
4. All work to be done in manner not to interrupt production.

Costs of productive maintenance program:

1. Materials and parts increase about 20 per cent first six months.
2 Maintenance crew size increase about 15 per cent first six months.
3. These costs being continuously offset by rising production.
4. After six months, sharp decline in parts and materials to level 30 per cent lower than present.
5. Maintenance crew size after six months reduced about 20 per cent.

Present production conditions:

1. All machines need maintenance, many need major repair.
2. High speed machines that were purchased for their cost advantage give no advantage because they are on breakdown too much of the time.
3. Lost time chargeable to machine breakdowns during the past month totalled ..... hours, or $..... in lost production.

Savings with new productive maintenance program in effect:

1. By restoring machines to peak operating conditions, and keeping them that way, without any interference to production.
2. Machine operators' morale will improve as machines will be easier to keep operating.
3. Costly machine breakdowns will be substantially eliminated.
4. Production machines will give peak performance, improving quantity and quality.
5. Maintenance costs for men and material will sharply decrease to an optimum level. **End**

From Dark...

To Light...

Without One Cent of Capital

Leased Lighting Plan Improves Illumination at Low Cost

By E. C. HARTLEY, Plant Engineer, Parker-Hannifin Corp., Cleveland, Ohio

EARLY IN 1952, we were studying the advantages of installing a more advanced type of illumination in our production areas. The lighting system installed at that time consisted of glass-bowl fixtures on fairly wide centers. The resultant low level of illumination made necessary the use of many supplementary fixtures to provide adequate lighting at the work stations.

Purchasing new fixtures, lamps, hangers, and circuit panels would entail a very sizable capital investment, and we were sure that management would not approve the expenditure of these sums for improved lighting. On the other hand, we were almost sure to win approval, if this improvement could be made without increasing our capital tax liability or requiring the use of existing capital funds.

You may remember that back in 1952 there was a very stiff excess profits tax. If your corporate liability was in the upper brackets, you had to think twice about capital investments. That is just what a lot of executives were doing.

On second thought, the idea of renting the equipment you needed seemed like a much better deal than buying. Rent is a business expense that reduces the profits subject to the excess profits tax. Thus, a company needing an expensive piece of equipment might rent it, cut tax liability and save capital for more urgent needs. Up to this time, no one had thought about renting a lighting system. Ordinarily, the fix-

tures are regarded as incorporated into the real estate.

Naturally, there were some counter arguments that we had to anticipate. One of these was what do we do when Congress repeals the excess profits tax. This, of course, happened and the current rate is down to 52 per cent.

We were prepared with some well considered replies. In the first place we would have a really good lighting system and there would be no problems with the unions on who would do the maintenance and at what rates. Furthermore, we would not risk the problems that arise from accounting tradition.

Accountants generally lump lighting in with several unrelated items of overhead that are often sacrificed by periodic economy drives. With outside maintenance responsible for care of the equipment in our plant, we would not reduce seeing conditions, if a cut were made in overhead expenses.

In 1952, we had a service contract with the C & S Maintenance Company to maintain the lighting system in our plant. This was rather unusual in the Cleveland area at the time. Most maintenance work, on lighting systems in other Cleveland plants and other plants across the country, was done with the plant's own personnel. This arrangement, while better than average, was by no means common. Even those plants that made little more than a pass at lighting maintenance were better than average.

We originally became acquainted with lighting maintenance service at our California plants. We liked the service for the better lighting value delivered by clean equipment, and the absence of labor and production problems that would have been incurred in doing our own maintenance.

With the approval of management, we approached the lighting maintenance company to determine if they would be interested in ownership of a new lighting system for our plant as well as the usual maintenance contract. They agreed and work was immediately started on wording the new contract.

The maintenance company agreed to install, at its own expense, a fluorescent lighting system, distribution panels, all wiring from the distribution panels to the fixtures, and lamps. We were expected to remove the existing lighting equipment and wiring and furnish feeders of suitable capacity to each of the distribution panels installed by the maintenance company.

Naturally, we would still pay for all electrical energy consumed by the new lighting system as well as permits required for its installation. As the installation is actually owned by the maintenance company, they are liable for any personal property taxes levied against the installation. We agreed to pay all other taxes, assessments and levies for the use of the installation.

It was agreed that the lighting maintenance company would inspect each fixture at least once every month and at that time replace defective tubes, ballasts, or starters. The entire installation would be completely re-lamped sometime between the 16th and 19th month of the servicing contract.

Table I. Costs for buying or renting

BUYING	
330 fixtures, starters, four circuit panels	$11,410
Fixture hangers	620
Lamps—Original equipment and one replacement	2,753
Installation	5,330
Income tax, Ohio personal property tax, insurance, freight, misc. costs	8,843
	$28,956
Interest, 3 years	2,216
Total outlay	$31,172
RENTING	
Rent for three years	$35,676
70 per cent tax relief	24,973
Subtracting tax relief from rental gives a three year cost of	$10,703

Life of the contract was set for three years and additional paragraphs covered quarterly payments and various performance specifications. The maintenance company agreed to complete the new installation in a reasonable time and we agreed to make payments promptly, when due. Provisions were made for extending the contract for a three year term after its expiration.

One of the most interesting items in the contract was that we were buying a guaranteed specific level of illumination. The lighting system is delivering an average of 65 ft-c on a guaranteed base of 50 ft-c. Cleaning frequencies were entirely up to the owner of the system and our only interest in the lighting system is in the maintenance of the guaranteed level of illumination.

To obtain these levels, two continuous rows of two lamp, eight foot, fixtures were installed, suspended from the ceiling on chain hangers. The fixtures are designed to direct some light to the ceiling area to reduce the contrast between the ceiling and the surrounding area.

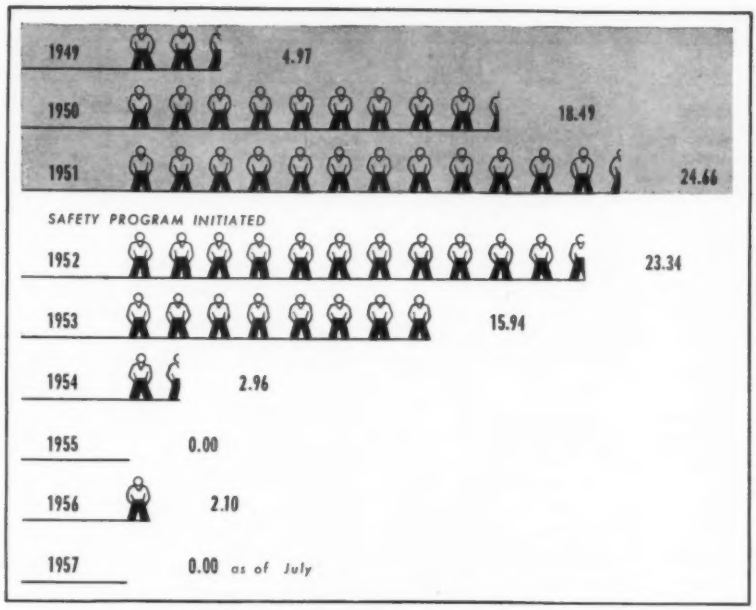
The windows and sash, on the right wall, were given a coat of white paint. This improves the reflectance of these surfaces during night shift operations and reduces glare from the bright sunshine during daylight hours.

The original leased lighting contract did not cover the entire Cleveland plant, but did cover a substantial 35,000 sq ft area. I suppose most readers would want to know at this point if we are still satisfied with this arrangement and if we would do it again. We can answer this very simply by stating that the orignal area has been extended so that now the contract covers 65,000 sq ft. We are now working under our third contract or second renewal.

The charges have gone down with each renewal contract and today we are paying what amounts to a lighting maintenance charge only. The lighting maintenance company can charge a higher depreciation rate than normally allowed. This fast writeoff recovers costs rapidly and they can reduce their charges.

Under the lighting equipment leasing plan, we calculated savings as follows. In case of outright purchase, the cost of the equipment would be depreciated over a 15 year period or $1930 annually. With our company in the 70 per cent tax bracket, 70 per cent of this figure, or $1351, would be paid out annually in taxes if the equipment were not purchased. This amounts to a potential tax relief totalling $4053 for three years.

At the end of three years the total cost would be $28,956, plus $2216 interest, less the $4053 net tax savings, or $27,119. This estimate did not include maintenance costs, estimated to reach approximately $4644, including the cost of lamps. It was determined later that maintenance exceeded this estimate. **End**



From There to Here

Dramatic and graphic evidence of the effectiveness of Eitel-McCullough's safety program. Accident frequency rate (frequency rate equals number of disabling injuries multiplied by 1,000,000 divided by employee-hours of exposure) tumbled from a high of 24.66, set the year before the program went into effect, to the irreducible minimum of 0.00 just two years after its start

Study, Not Snooping, Humanizes Safety

"Committee of Everyone" Cuts Accident Rates

AS WORK BEGAN one day last week at San Bruno, Calif.'s Eitel-McCullough, Inc., a press operator buckled his leather wristband and tested the cable which chained him—for safety's sake—to his machine.

In another department, an engineer carefully adjusted the lead shielding around an electronic tube which, once operative, might emit X-rays. Shielding didn't make the job easier. It simply made it safer.

Yet, but a few years ago Eimac's maintenance staffers—including maintenance chief Clifford Ricker—would have bet you 10 to 1 that no pressman would willingly chain himself to his machine—safety or no.

For, as in most plants, it's not that management has to be sold on safety devices. It's the employee who's got to be sold . . . and solidly. And at Eimac—through a dual kind of indoctrination—they are.

The difference at Eimac is the indoctrination—a subtle and purposeful program which: 1. psychologically prepares employees to accept safety devices; 2. psychologically trains foremen and supervisors how to introduce new devices—and assure their bench-level acceptance.

For safety at Eimac is doubly needful. As a top U. S. maker of transmitter tubes, the company has more than its share of hazards: mechanical dangers (like that ram press); high voltage (to 120 kv and higher); radiation (from high-frequency tubes and nuclear by-products); tricky chemicals . . . cyanide, one of the most deadly, among them.

Employee's Safety Committee: Eimac's subtle safety program aims at building a hard-core of safety-minded employees through a revolving committee (new group every six months) which, once indoctrinated, returns to

Some of the 35 keys in this high voltage d-c console which must be in their locks before the power comes on. When an engineer enters a danger area in the high voltage lab he simply removes one of the keys effectively de-powering the area

bench and belt-conveyor to practice and accept what it's learned. Not safety snoopers, but safety students, is Eimac's aim.

In a word: whereas most plants set up what amounts to an elite, standing committee on safety, Eimac aims to make everybody the committee. Moreover, where some plants indoctrinate safety committees to watch-dog fellow employees, Eimac schools them to watch-dog themselves. And, in the process, to turn safety-minded.

At Eimac, and for good reason, you don't hear a workman muttering, "Those jerks on the safety committee? Why, they're just a bunch of snoopers!" You don't hear it because at Eimac just about everybody is the safety committee . . . or was.

Says safety director C. Robert Love, a onetime FBI agent, "An army wouldn't get along very well if everyone was a general. But in safety the more generals the better."

The idea: self-inspection of an employee's own department.

In practice, Eimac's indoctrinated, revolving (and ever-growing) hard-core of safety-minded employees, smooths the way for plant engineering to install the gadgets and guards which most plant maintenance chiefs would like to install—but can't, because of employee hostility.

Foreman's Safety Committee: like the Employee's Safety Committee, it's revolving, meets once monthly for an hour's study—the lectures psychological rather than nuts-and-bolts. The aim: to indoctrinate foremen with the psychological tools for "selling" safety devices to employees already conditioned to accept them.

Foremen's and supervisor's course —in six hourly parts—is based on the National Safety Council manual, with an assist from Stanford University's Graduate School of Business (Stanford is a neighboring university).

First hour's lecture details the rudiments of "Psychology of Safety in Supervision." By the sixth and final lecture Eimac foremen (including reps from the maintenance department) are delving into some deeper psychology: why some men willingly accept a safety device, while others won't. How to sell safety . . . and keep it sold.

Results of this double-pronged program speak for themselves: with production booming, Eimac's accident frequency rate jumped to 18.49 in 1950 (far above the average for its segment of industry). In 1951, frequency climbed higher . . . to 24.66. A dip —to 23.34— in 1952 evoked no elation, either from production or maintenance. For the frequency rate was still way out of line (and so, also, Eimac's insurance rates).

That's when Eimac turned safety-minded . . . decided everybody should be a "safety general."

A four-phase program was set up, as shown in Table I.

Program established, Eimac installed some noteworthy safety devices:

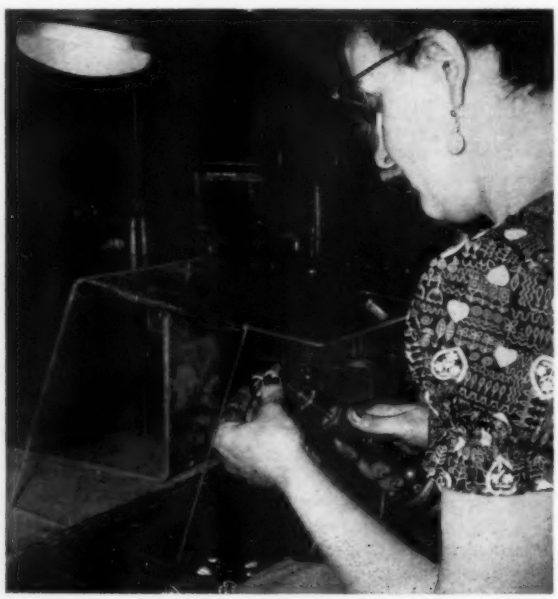
Eye protection: In grinding molded glass headers which form part of the base and external connections for certain vacuum tubes, operators objected to goggles (particularly the side blinder variety, which were hot and uncomfortable). Substituted was a formed plastic shield enclosing the operator's hands and work . . . rather than his eyes. Still used, however (and with

(Continued on page 194)

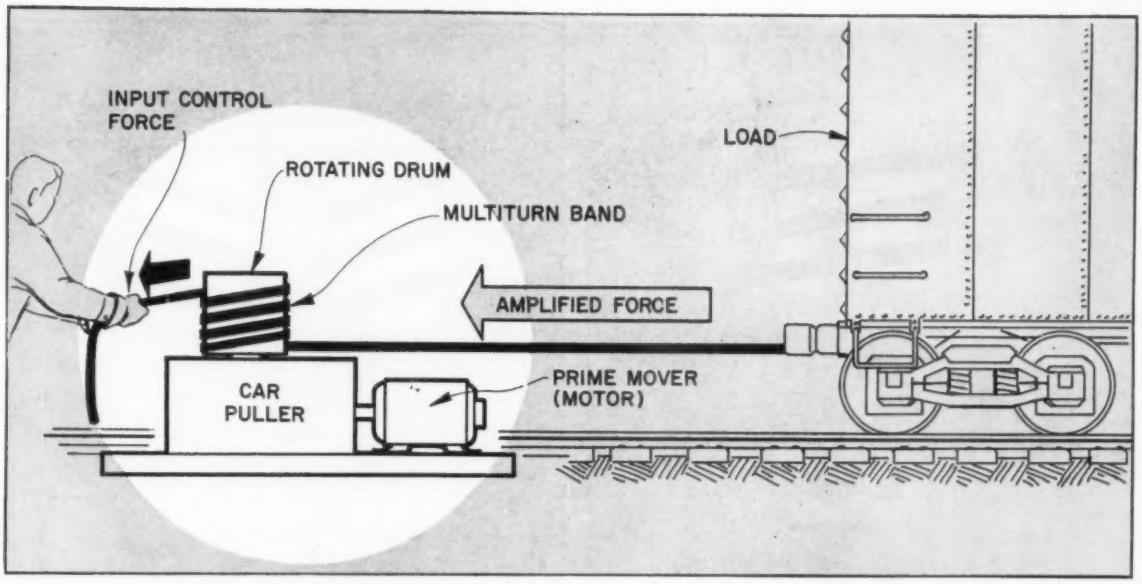
Table I. These are the four phases of program established by Eitel-McCullough

1951-52 PHASE I	1952-53-54 PHASE II	1952-57 PHASE III	1957 PHASE IV
Assessment	**Organization**	**Implementation**	**Reassessment**
Existing policy	Committees	Of Phase II	Progress made in Phase II
Existing procedure	Procedures		
Safe practices	Inspection		
Unsafe practices	Reporting		
Physical lay-out	Follow-up		
Physical conditions	Training		
Employee attitudes	Reports and Forms		
Management attitude	Promotional		
Hazardous processes			
Hazardous locations			
Injury records			
Injury sources			

This lead shielding around high-frequency tubes shields workers from x-ray emission. In addition, engineers wear lead-glass goggles, and dosimeters to check on x-ray exposure



Double protection for workers is provided by this plastic shield over the grinder and does away with heavy-uncomfortable goggles. Workers don't mind lightweight glasses



Familiar car-puller is a good example of method used to obtain a very high output force with a relatively low input force

Multiply Torque This Easy Way

Electromechanical Amplifier Reduces Control Problems

By R. H. EISENGREIN, Director, Electronics Division, Seneca Falls Machine Co., Seneca Falls, N. Y.

CONTROL SYSTEMS, used on automatic production equipment, urgently need simplification. There is currently a scarcity of technically trained maintenance personnel in industry and it is essential that new devices introduced require a minimum of maintenance skills.

New control systems must function with increased accuracy and guaranteed repeatability of performance. These important factors were considered in the development of this new mechanical torque amplifier, which was presented at the 22nd Annual Machine Tool Electrification Forum sponsored by Westinghouse Electric Corporation.

To obtain electromechanical conversion, we decided to use a two-phase induction motor designed for high speed response. These motors have been proven in use and their characteristics are understood. In addition, power required to control these motors is low enough to permit the use of readily available electronic, magnetic, or transistor amplifier components.

If the relatively low-power output of these servomotors could be mechanically amplified, into the horsepower range, the resulting combination of components would meet our design requirements. Since the major unknown was the mechanical power amplifier, we investigated basic principles, materials, and components to find a satisfactory solution.

A simplified explanation of the basic principles of operation of the final design is best explained by referring to Fig. 1, which shows a "windlass" being turned by a source of prime power. Wrapped around the drum are several turns of rope, one end of which is connected to the load. The other end of the rope provides the means for control.

When no force is exerted on the input end of the rope, maximum slip exists between the rope and the drum and no output force exists. As a force is exerted on the input end of the rope, in the direction shown by the arrow, an amplified force exists at the output end. The available power, to move the load, comes from the drum. In this simple arrangement, we see that any output movement always equals the input movement and the output force is a multiple of the input force.

This same principle is used in the mechanical power amplifier, Fig. 2. To obtain the required bi-directional output needed in servo systems, two drums are mounted back to back. Input control torque is supplied by a low-power, two-phase servomotor.

To avoid the limitation of the linear motion out for linear motion in system shown in Fig. 1, the final design provides for a constantly rotating input. Both the input and output ends of the multiturn band around the drum are connected to gears which have their center lines concentric with the drum axis.

As the servomotor rotates the in-

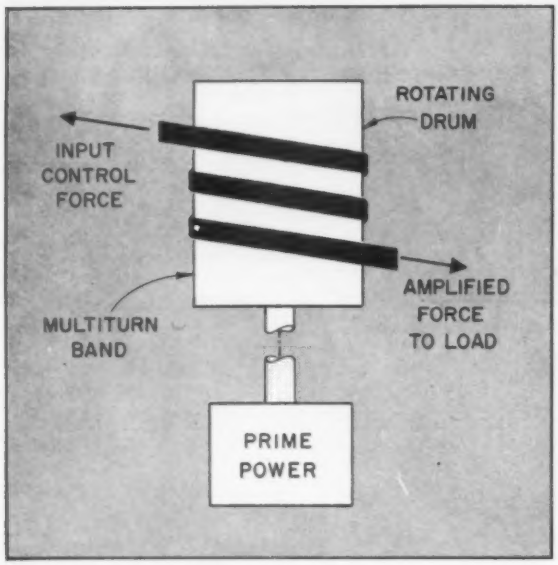


Fig. 1. Input control force provides the friction coefficient required to transfer power in the rotating drum to the load

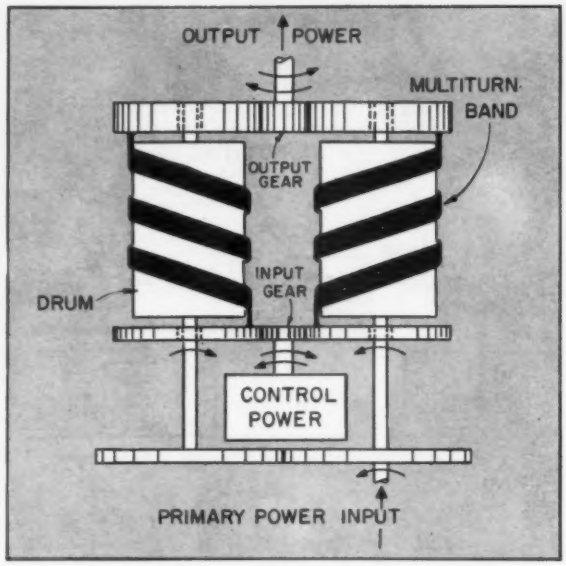


Fig. 2. Linear uni-directional output is converted to rotating bi-directional output by use of gears, double drums, and bands

put gear, the band-drum combination forces the output gear to rotate with it. Thus, a rotating output is available. In operation, clockwise rotation of the servomotor causes the first band and drum assembly to provide clockwise output while the second drum is idling. For counterclockwise outputs of the servomotor, the second band and drum are energized while the first drum is idling.

Actual rating of the mechanical power amplifier is a maximum of 1.66 hp. Its characteristics, Fig. 3, are shown as the familiar family of curves of a two-phase induction motor designed for servosystem operation. For this particular mechanical power amplifier, the maximum torque-to-inertia ratio at the output shaft is limited by the input servomotor used. The theoretical output torque-to-inertia ratio is over 60 times this value.

For a tracer lathe application, other components needed are an electronic amplifier, a power supply, and a displacement transducer. The transducer provides the basic control signal information. This is a low-level voltage that is directly proportional to dimensional variations of a mechanical template.

These voltages are obtained through the use of a linear transformer. The transformer itself consists of an excitation winding and an output winding coupled to the excitation winding via a movable core. The output voltage reaches a null position for only one unique position of the core.

Magnitude and phase of the a-c output voltage is proportional to the displacement and direction of displacement from the null position. Thus, the system knows the direction and rate at which load moves.

In the displacement transducer, the movable core is connected to a stylus, which is spring biased to project from the housing. The unit is completely sealed and well adapted to the rugged environment in which it is used. Because of the low mass of the movable core, the displacement transducer introduces no appreciable time delay into the system.

Electronic amplification increases the transducer signal to a power level sufficient to control the two-phase servomotor. The electronic amplifier accepts both the transducer signal and a second signal from a tachometer integrally coupled to the servomotor. The tachometer feedback, together with a gain control potentiometer, provides a simple means of matching the control system to a variety of load characteristics for optimum performance.

Filament and d-c voltages needed

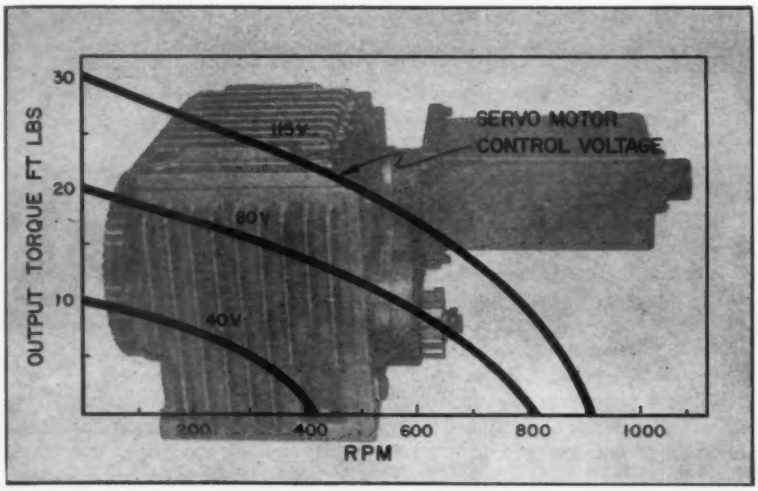


Fig. 3. Torque-speed curves of amplifier at various servomotor control voltages

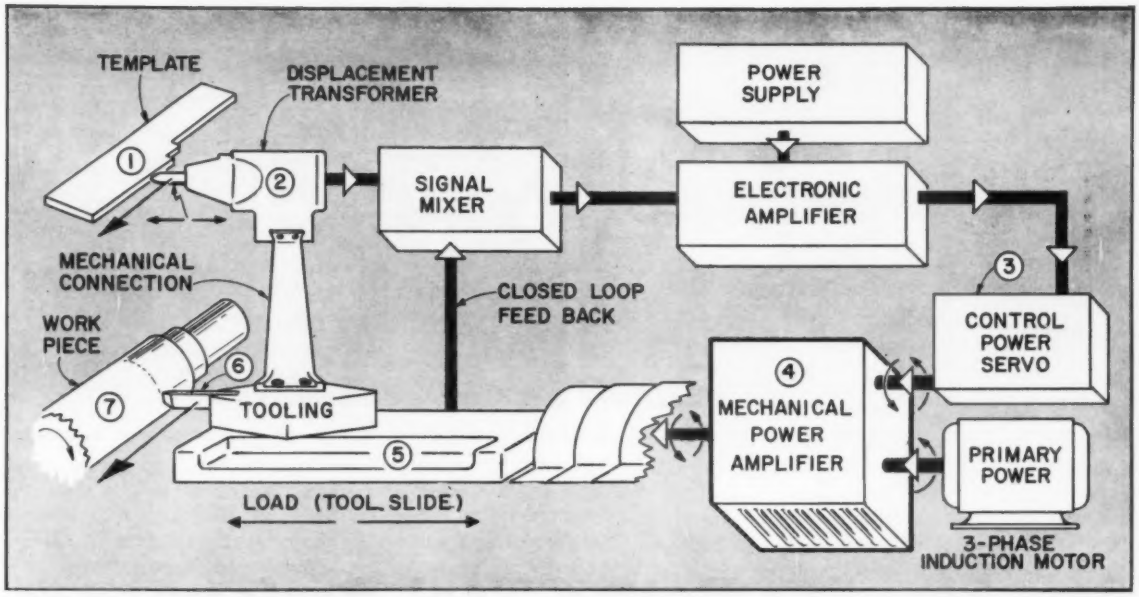


Fig. 4. Diagrammatic representation of complete control system. Circled numbers identify parts shown in photograph, Fig. 5

for operation of the electronic amplifier are provided by the power supply. Its indicating lights reveal the presence of both a-c input and d-c output voltages. This feature, together with the fuse protection for overloads, facilitates maintenance of the unit.

Coupling all of these units together, Fig. 4, makes a complete closed loop system. The machine slide, to be positioned, is mounted at an angle of 45 degrees with respect to the centerline of the shaft to be turned, Fig. 5.

Feedback, in this control system, exists by virtue of the fact that the body of the transducer is bolted to the slide and the movable core and stylus float independently in this body. They are spring-loaded so that the stylus tip attached to the core projects out of the body. With the core in this position, the linear transformer furnishes a voltage which is electronically amplified and fed to the servomotor.

Servomotor torque is mechanically amplified and the resulting mechanical power amplifier output causes the slide to move towards the template. When the stylus tip eventually touches the template, it is forced into the housing until the null point is reached.

At this time, servomotor voltage is zero, mechanical power amplifier output is zero, and the slide stops moving. As the machine carriage starts feeding, and moves the slide parallel to the spindle axis, the stylus core is deflected into or out of the stylus body by the template dimensional changes. The resulting voltage output of the linear transformer causes the mechanical power amplifier to move the slide and also the stylus body in or out. The system constantly tries to reduce the stylus output voltage to zero via this feedback between core movement and stylus body movement.

To summarize the operation, the mechanical power amplifier output that moves the slide is derived from a fixed-speed power source, in this case, a three-phase induction motor. The servomotor, via the amplified stylus signal, merely determines how much of this available power is needed at the slide. **End**

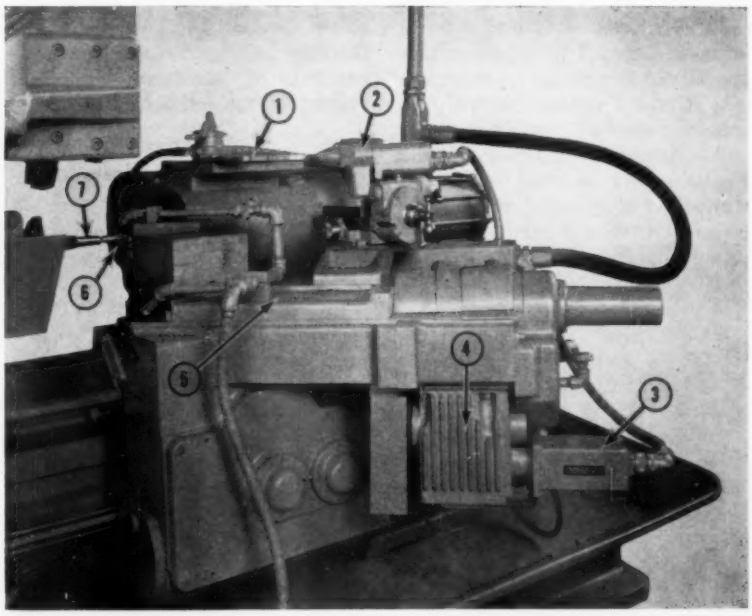
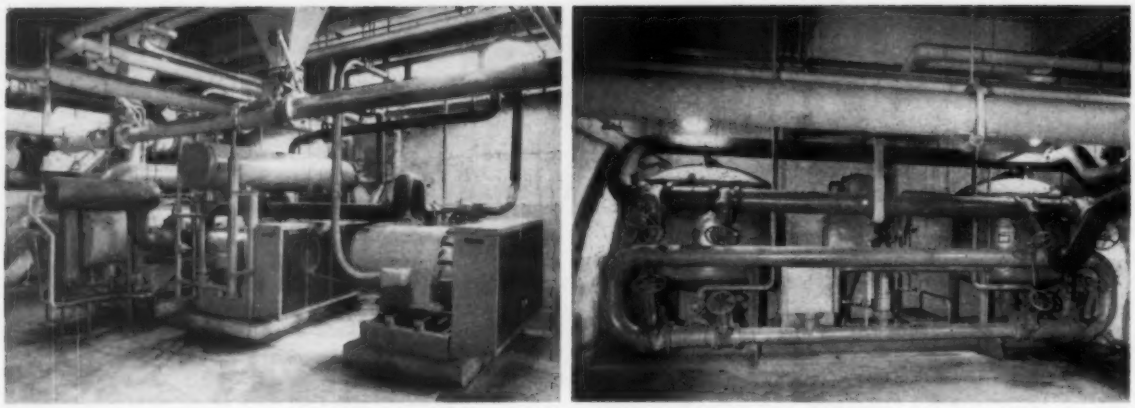


Fig. 5. Automatic tracer lathe. Note transducer (2), is mounted on cross-slide (5)



Refrigeration unit of compressed air drying system at Appliance Park is shown at left, the evaporation unit is at right

Dry Air—For Better Tool Performance

New Compressed Air System Paid Its Way in Year's Time

By JOHN VONDERHEIDE, Manager, Plant Engineering, General Electric Co., Louisville, Ky.

IN THIS DAY of high-speed production, compressed air plays a very important part in efficient operation of mechanized facilities, automatic machinery, and powered hand tools.

It can be said that the day when "morning blow-down" can be tolerated has long since passed, because labor loss is a major factor in cost control. In addition, any opportunity to reduce maintenance cost is now a fertile field with reference to over-all product cost.

At Appliance Park, Louisville, Kentucky, we switched from a decentralized compressed air setup to a central dry compressed air system. Based on careful engineering study and operational experience, it was established that a capital investment in excess of $45,000 for such a system could be recovered in slightly over one year, in maintenance savings alone.

Intangible savings from minimized automatic equipment downtime (eliminating production loss) can also be accepted as an established advantage from the use of dry air.

With the original plant construction, a permanent air compressor station was placed in service in early 1953. The original machines were installed for a maximum capacity of 15,000 cfm. This installation was equipped with conventional intercooler and aftercooler equipment, along with operational procedures to maintain a final compressed air temperature of 100 F.

The manufacturing plants (there were five separate plants at the time) were designed with the idea that dry air requirement would be handled by auxiliary equipment located in the individual buildings.

Moisture in the System

However, soon after manufacturing plants were put into operation, numerous complaints were received from operating personnel with reference to presence of moisture and even oil emulsion in compressed air lines. "Morning blow-down" became a necessity and a most costly procedure because of the widespread use of air tools and other process air requirements. These troubles happened even though we had all new and modern facilities including line type dryers and moisture traps.

We finally decided to determine the actual difference between spot drying in the individual buildings and a central drying system for supplying compressed air to each of the buildings. The result clearly showed that a central system would cost very little more than the actual field requirements as of that date.

The initial drying system was a refrigerant type unit which seemed to be the most practical for the needs of that date. The equipment consisted of two 125-ton refrigeration compressors (one considered as standby), one condenser, one chiller, and the associated auxiliary items and controls. This system was designed to use Freon 22. The specifications stated that the equipment was to cool saturated air at 110 psi and from 100 F to 40 F. The maximum capacity was to match the original air compressor station, which was 15,000 cfm.

When the drying system was placed in service (June, 1954), there was an important improvement in the previously reported manufacturing equipment operational troubles. Careful observation of the system soon established that a final air temperature of 40 F was not the optimum condition for the best results.

For example, condensation still occurred in the main lines as the air was piped over an outside trestle

from building to building. Appliance Park has also grown according to long-range planning, and maximum compressed air demand had to be revised upward 5,000 cfm to a normal working-hour usage of 20,000 cfm. Additional compressor equipment was installed at the main station, for a total capacity of 25,000 cfm, including one machine for standby. All of these main air compressors are of 1,000 hp, electric driven, 5,000 cfm size.

By early 1957, the five major manufacturing plants were all running at heavy production rate, and a sixth building was under construction with scheduled completion within a matter of months. The compressed air demand had reached 18,000 cfm and was beyond the limits of the initial drying facilities. Because the flow rate through the refrigerant dryer was so overloaded, air velocity through the chiller was sufficiently great to entrain water droplets which were carried into the main distribution line.

Plant engineering people had given careful study to the performance and end result of dry compressed air with reference to production savings, and a "balance sheet" was prepared to weigh various means of increasing the capacity of the system and to properly establish satisfactory dryness of delivered air from a long-range viewpoint. It was determined that 20 F would be maximum dew point to achieve overall efficiency. Depending upon economic conditions and equipment limitations, it was established that a zero Fahrenheit objective was not at all unreasonable.

Central System Installed

Based on these results, we designed and selected a central drying system which is located at the boiler house in conjunction with the main compressed air station. Engineering planning established that an absorption type dryer would be installed in series with the refrigerant system. Obviously, straight refrigeration was not practical for the low temperature condition required.

The added absorption equipment consists of a prefilter of activated alumina for oil removal, two silicagel towers for moisture retention, a blower, heater, plus condenser for reactivation. The towers are used alternately on a six-hour cycle to allow for reactivation period.

With the combination refrigeration and absorption system in place, a rated capacity of 20,000 cfm was achieved with compressed air entering at 115 psi and 100 F, moving through the refrigerant dryer chiller and cooled to 50 F, thence through a horizontal moisture separator, to activated alumina prefilter, silicagel tower, and into the main line for service use throughout the buildings. The dew point of the final air leaving the plant is presently —20 F, when measured at atmospheric pressure. The system is sized very close for required capacity, and the possibility of tolerating +20 F temperature is the only reserve margin provided.

Air tools and air controls do not "foul up" as they previously did, and preventive maintenance can be established on a more reliable schedule. A summary of direct dollar savings by maintenance improvement shows that the dry air program paid its way within a 12- to 15-month period. **End**

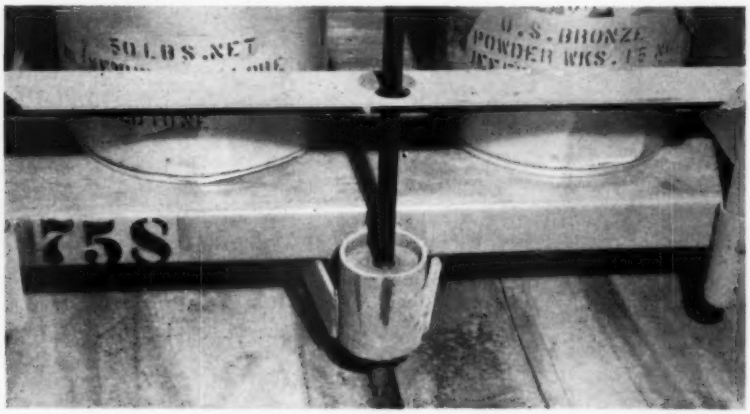
Rubber Shock Absorber Reduces Cart Impact

PACIFIC Intermountain Express engineers have come up with a hard-rubber shock-absorber that reduces cargo cart impact, lessens chance of cargo toppling to the floor.

Problem: Along P-I-E's quarter-mile-long terminal dock in Los Angeles dockmen load a cart, then give it a shove. Dock is so constructed that cart free-rolls over a conveyor cable slot, is automatically grabbed and pulled into line. This "engaging" thrust can be violent as the tongue is engaged; violent enough to shake the cart and its cargo . . . toppling cargo which may be stacked high.

Solution: Shop-invented hard-rubber shock absorber. Shock unit, its diameter slightly less than the tongue well's ID, its length matching the well's, is drilled with deep, ½-in-diam. holes. Shock absorber nests in the tongue well, isolating the tongue and taking up the initial impact of the "engaging" thrust.

Result: Impact is greatly reduced, lessening the chance of toppling the cargo which is stacked on the cart. **End**



Above: Close-up of shock absorber. Application of absorber is shown, at right, nested in tongue well of cart

Here's How To Do It — In Pictures

Left: Typical example of finished flat roof. Brilliant appearance of roof is due to use of a good siliconed aluminum roof coating for top finish

Piggy-Back Roofing

Cold-Applied Surface Cuts Costs

RE-ROOFING OF built-up roofs without removing the old material is quite feasible when the old surface is well-prepared and the deck is structurally sound. As in painting, where the quality of the paint job depends on the quality of the surface to be painted, so too the quality of a re-roofing installation depends on the condition of the roof to be covered.

Leaves, air-borne dirt, debris should be swept off. Blisters should be cut open and cemented down. Raised seams, torn and ragged flashings should be recemented and loose nails removed. On old tar and gravel roofs, the felts should be removed if necessary to provide a smooth, even surface free from gravel particles and tar pitch.

If the surface is brittle or badly dried out, prime coat it with a quality non-fibrated asphaltic base coating to revitalize weatherworn felts with essential oils. Then you are ready to proceed with the actual roofing job.

First job is to cut the heavy-duty, 53-lb roofing felt into strips not over 18 ft long and stack them flat for 24 hr before use. Then, proceed as follows.

Step 1. Starting at and working along the lower edge of the roof, apply Hold-Tite sealing compound at the rate of 2½ gal per 100 sq ft in a swath 36 in. wide. On small roofs, arrange sealing compound application and work procedure so the compound can set up for 10 to 15 min before the felts are applied.

Above: Embedding felt in sealing compound. Note overlap of second row on previously embedded felt

Left: Second row starter strip is overlapping first row by 3 in. Second row is half length of first row

Below: Brushing over felts with stiff pushbroom assures tight seal of both end and side flaps of the felts

Step 2. Returning to the starting point, firmly embed in the compound-coated area, an 18 ft starter strip of 53-lb felt extending far enough over the roof edge so that the felt can be turned down over and nailed to it.

Step 3. Turn down felt over roof

edge and drive in barbed nails through flat caps on four-inch centers.

Step 4. Continue applying, turning down and nailing 18-ft strips of 53-lb felt along the roof edge coated with sealing compound, making sure that the ends of each new strip overlap the previously laid strip by 4 in.

Step 5. Working from the starting point, broom out the felt with a stiff pushbroom or a light roller so that all laps are cemented to the old roof.

After brooming, return to the original starting point and work along the first applied felt strips. Apply sealing-compound in another swath 36 in. wide being sure to overlap the first felt application by 3 in. As a starter strip on this second row, use a 9-ft piece of felt and then continue to lay 18-ft strips. Starter strip on the third row of felts should be 18 ft in length. On the fourth, it should be 9 ft again. By alternating 9- and 18-ft starter strips in this way, the end laps of the felt lengths are staggered over the entire roof.

When the whole roof is covered with felts as described above, the nails and caps along the roof edges should be covered with non-rotting, reinforcing fabric embedded in roof coating. This will provide the nails and caps with added protection against rusting and keep them from working loose.

The final step in the installation of the one-ply roof is the application of a siliconed roof coating at the rate of two gallons per 100 sq ft.

Though essentially the same steps are followed in the installation of one-ply roofs that are considered steep because they exceed a 6 in. per foot incline, sealing compound and felt application are done vertically instead of horizontally. In addition, as each strip is laid up the roof from the lower edge to the peak, the top-most end of each strip is nailed down and then covered with the next felt strip with a four inch overlap.

In all cases, on steep roofs, the top-most strip should extend 6 in. over the roof peak and be securely nailed on each side of the peak. After all the felts have been applied, the peak should be covered from end to end with a final 18 in. wide strip of felt that is folded over 9 in. on each side of the peak.

Though only one-ply roofs have been dealt with in this article, there are specifications for multi-ply constructions which are available from The Monroe Company, Inc., 10703 Quebec Ave., Cleveland 6, Ohio, makers of Vulca-dek roofing systems. By the same token, old built-up roofs over other than wood decks can serve as the base surface for re-roofing. Specifications also are available for direct-to-deck applications. **End**

For Efficient Storage:

Fiber Tubes for Racks

By GEORGE J. BEVANS, Industrial Engineer, Systems Council

HOW CAN RAW materials and parts be stored conveniently, with minimum handling? A new and tested storage system for metal and plastic strips, pipes, bars, and mouldings solves these problems simply and inexpensively.

This low cost system can be easily and quickly installed, and makes maximum use of a storage area. It saves time and labor costs, because it requires less handling, and makes inventorying a simple operation. Economical fiber tubes that are the heart of the system provide fire protection, and keep the material dust-free.

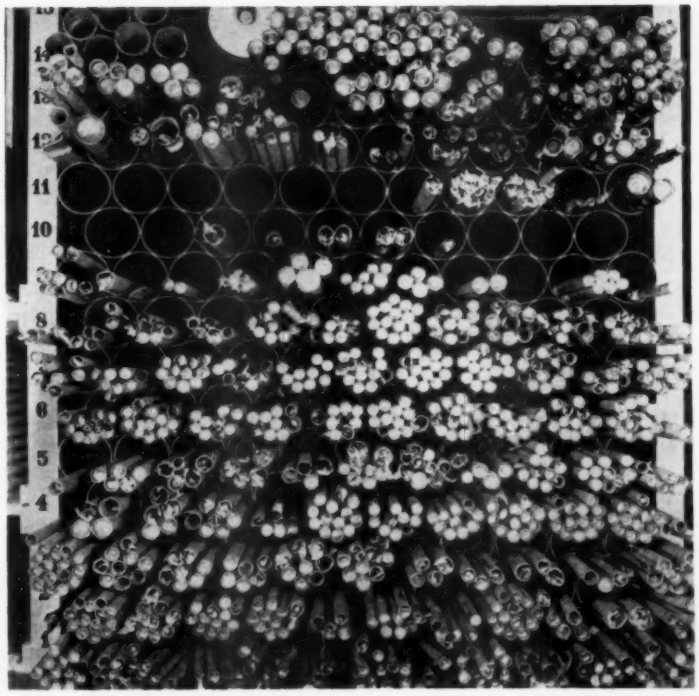
With dozens of different sizes and styles of materials to store and inventory, every item is immediately accessible for removal or inspection, and every tube is readily available for storage use.

Basically, the system consists of a number of fiber tubes placed in rows, from the ground up, as high as the fire code allows. Each type or size of material is placed in a separate tube or group of tubes. Any single piece of material desired slides easily from the tube, and each type is easily identifiable. Material at the bottom of the storage unit is as easy to get as that at the top, because all other tubes hold their position.

A major benefit of the system is the simplicity it affords in keeping inventory. Letters are assigned to the rows, and the tubes are numbered. A tag is placed at the outside end of each tube giving full details of type of material, length, grade, re-order quantity, etc. An index card in the office, showing each location and duplicate data from the tag, completes the inventory control.

First step in laying out a system is to determine the amount of space available for storage. Next, decide which size tubes you require—they come in all size diameters. The size you need is naturally determined by the quantity of each size of material that is stocked. **End**

Fiber tubes are inexpensive, light and strong and serve ideally for storage of such lengthy items as pipe and rods; come in any length up to 48 ft



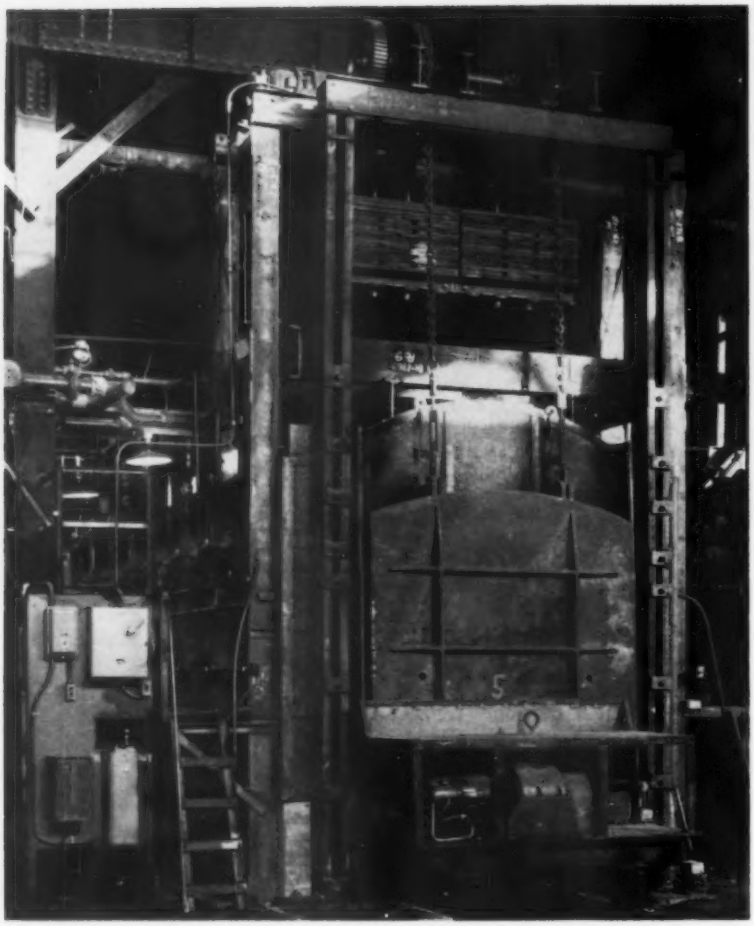


Fig. 1. Counterweighted furnace door's movement results from the operation of the motor at the top of the frame. At the bottom of the door there is a motor and gear setup which powers a few of the axles by means of chains

Car-Type Multipurpose Furnace

Plant-Built Unit Follows Plant-Engineered Design

By R. A. BUTLER, Plant Engineer, Struthers Wells Corp., Titusville, Pa.

RECENTLY COMPLETED as part of a general expansion program at the Forge Division of Struthers Wells is a new furnace, embodying some features and characteristics considered noteworthy, although the unit is relatively small.

Problems of size determination, desired characteristics and general specifications were a matter of compromising our needs with some hindsight, forecasting and keeping in mind that we had a limited amount of space.

The nominal size of this multipurpose furnace is 6 ft by 6 ft by 36 ft with a design capacity of 65 tons. It is a car-bottom type, gas-fired furnace, designed by the plant engineering department to combine as nearly as practical all the advantages of a recirculating furnace, but with capacity for a top operating temperature of 2150 F. The car deck is 6 ft wide, with an effective heating length of 37 ft and the furnace opening will permit loading the car to a height of 5.5 ft.

It was evident from the outset that the furnace, to complement all the existing facilities, would have to be a multipurpose unit with a versatility that would not limit it exclusively to tempering cycles as in a recirculating furnace. Still, it was to provide heat uniformity, fuel economy, and maximum efficiency with operating temperatures between 400 F and 2150 F. To meet present day restrictive material and product specifications it was to also effect reproducible uniformity in quality and precision timing of the heating cycles for close scheduling and maximum production.

There was an agreement with the metallurgical department as to the requirements and expecta-

tions of the furnace. To achieve the greatest possible length, it was necessary to design and build a 20-ft wide by 40-ft long lean-to.

Considering basic computations together with studies on heat saving, refractory layout and structural design, we prepared a general assembly drawing scaled precisely to size. This showed the proposed door-lifting and car winch mechanisms and how the furnace and instrument room fitted into the allocated space.

From the data accumulated, the permissible rate of heating was to vary from 30 to 100 lb per sq ft of hearth area per hour because of the general purpose nature of the furnace. For design purposes an average value of 60 lb per sq ft or 18,000 lb per hour was selected with an average cycle of from 12 to 16 hours although the 48-hour cycles are customary.

Furnace Zones

Since the critical nature of the extremely variable furnace loads required that temperature differentials be restricted to plus or minus 10 F with a maximum of plus or minus 20 F, it was elected to zone the chamber into four sections. The front and rear zones contain four burners each.

We especially wanted to zone individually the ends of the furnace because, characteristically, the door end is the coolest and the rear end runs hottest. The two mid-section zones comprise eight burners each. The zoned groups of burners are manifolded to their fuel and combustion air sources and each of the four zones is individually controlled by its own instrument, through a control couple and motor-operated valve.

The same reasoning behind our selection of four zones instead of a lesser number applied also to the selection of smaller and more burners rather than fewer burners of greater capacity. That is, we wanted to be assured of even heat distribution throughout the furnace chamber under all temperature conditions—particularly in the low temperature tempering cycles. We selected burners which would provide maximum turn-down, minimize stratification of combustion gases for uniformity and provide a reducing, neutral, or oxidizing atmosphere as required. See Fig. 2.

Four recording potentiometers, a master control including a programmer and proportioning relays with a range from 0 to 2400 F and eighteen thermocouples constitute the instrumentation which automatically adjusts or proportions the fuel according to demand for balancing, raising or lowering the temperature at each of the four zones. See Fig. 4.

The programmer provides an upscale rate interrupter for heating with a range of 10 to 200 F per hr, a 48-hour soak timer, and a downscale rate controller for cooling at any rate from 5 to 100 F per hr.

The eighteen-point indicating potentiometer serves to check temperatures at any part of the load or furnace chamber during a heating cycle. A high temperature safety cut-off is incorporated to safeguard against any possibility of overheating. This instrument can be adjusted to function just above any temperature at which a maximum is desired. Flame safeguards are provided also.

A high temperature can be reached rapidly at a rate of 200 F per hr with the burners operating on a correct air-gas ratio, and for holding a temperature or soaking, the fuel only is throttled as directed by the program controller to balance furnace zone temperatures.

Maximum uniformity of temperature to plus or minus 10 F is achieved not only by the strategic spacing of the burners and flues and their zone control couples but also by the large volume of combustion gases emitted by the burners. Back pressure in the furnace is held more or less constant at 0.015 in. W. C. (water column).

The total maximum heat input from the twenty-four burners is 9,840,000 Btu per hr. Pressure of gas at the burners is 19 in. W. C. and air pressure 8 oz. The blower unit on the furnace develops 10 oz air pressure at 1700 cfm.

Flue System

Flues rise through the walls from slightly above the car top level and vent into the atmosphere. Dampers are not used in the flue system but each exit is partially restricted with a refractory tile. The amount of restriction was determined at the time the burners were adjusted.

The burners were adjusted to 12 per cent CO_2, 5 per cent O_2, 0 per cent CO for a combustion efficiency of about 56 per cent. The flue temperatures at this time were 1300 F. The thermal efficiency of the furnace has ranged between 9 and 24 per cent.

Due to the size of the furnace and the space required for regenerators

Fig. 2. Some of twenty-four nozzle-mixing type burners used in the furnace

Fig. 3. How furnace loads are handled

or recuperators, studies revealed the use of such heat saving devices would be too costly to install and use in recovering heat losses in the flue gases.

The best performance so far as thermal efficiency is concerned occurs when the furnace is loaded at or near its design capacity of 65 tons and when operated in any cycle up to about 1650 F. After this, at higher temperatures the efficiency begins to taper off. For occasional checks on efficiency and operating rate a totallizing gas flow meter is installed in the gas supply line.

Fuel economy and structural studies resulted in the furnace chamber enclosure having 13½-in. walls with 2-in. insulation and 9-in. arch covered also with 2-in. insulation. Heat resisting cast iron sand-seals enclose the furnace chamber around the perimeter of the car body. The cast iron door which is lined with 9 in. of refractory is inclined 5 deg against the door jambs. In this manner the weight of the door tends to help seal the opening. The counterweighed door is motor operated to raise or lower at a speed of 22 fpm.

Foundation and Side Walls

Fifty-seven cu yd of concrete was poured in the foundation. The concrete side walls which would otherwise be exposed to the hot furnace chamber when the car is removed, are insulated with courses of firebrick.

To eliminate the customary car winch and chains stretching across the floor of the main bay, the car is designed to be a self-propelled unit. A wound-rotor gear motor mounted on the front end of the car transmits power to three pairs of drive wheels underneath the furnace car, through roller chains and sprockets keyed to the axles. See Fig. 1. Power to the motor is supplied through a cable reel to pay out or retract the cable as the car moves in either direction.

Car Motor Torque

The electrical circuit includes a heavy-duty resistor and drum controller which together with the motor characteristics permits low torque on starting to prevent wheel slippage and sudden jolts. Car speeds to 40 fpm with a 100-ton load may be attained which lead to fast removal of the car from the furnace, particularly for critical oil or water quenching operations.

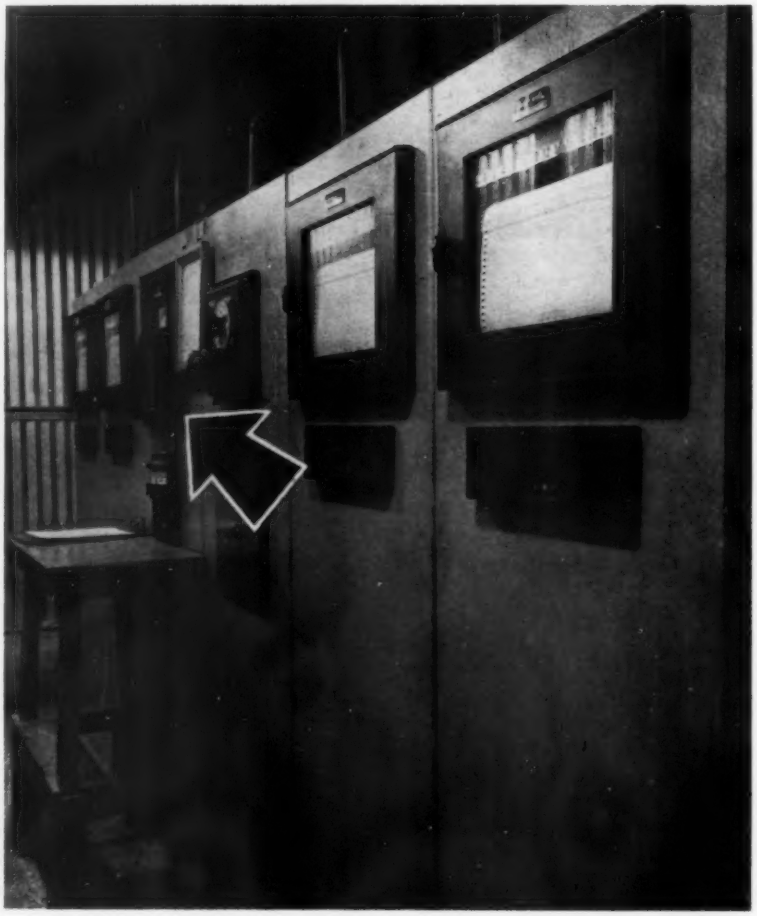
All of the car wheels use roller bearings and ventilation is provided under the car to limit the temperature to 400 F. This prevents damage to the bearings. Short sections of 8-in. pipe were cast into the concrete foundation side walls and located to coincide with each wheel and axle when the car is in the furnace.

Our Welded Products Department, Forging Department and Machine Shops, contributed their share of component parts for the furnace structure, such as structural subassemblies, axle and wheel forgings and weldments.

Fitting of the maze of gas and air piping along with the quite intricate instrument wiring was accomplished by the Plant Maintenance and Electrical Departments. The latter includes several men trained for the installation and care of all our numerous furnace instruments and the maintenance department includes experienced pipe fitters, qualified weldors, millwrights and bricklayers.

The cost of this major "do-it-yourself" project approached $70,000 and it was completed in less than six months along with other plant projects having similar proportions. **End**

Fig. 4. Thermocouple transfer box (arrow) can pick up 18 temperature points



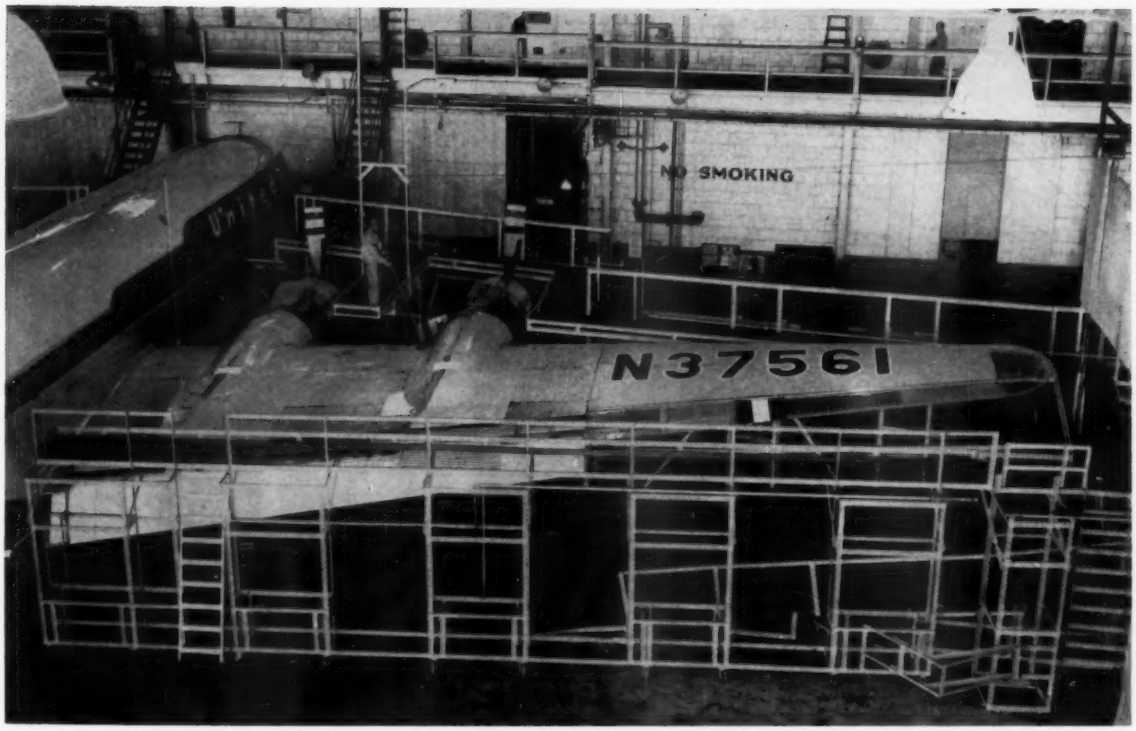


Fig. 1. Metal scaffolding completely surrounds wing and engines. With long-handled brooms, workmen can reach all areas

Wrap-Around Dock

Movable Scaffolding Simplifies Cleaning of Airliners

ACCESSIBILITY was the keyword in the design of a "brightening dock" at United Air Lines' maintenance base at San Francisco's International Airport. Airliners must be thoroughly scrubbed periodically, to maintain their appearance and to combat corrosion. To do the job most economically and safely, engineers at United have developed the brightening dock—essentially a rolling scaffold.

After a four-engine airplane is nosed into position in the hangar, the steel scaffolding dock is rolled into place, surrounding the airplane. The scaffolding is made of galvanized, slotted angle, produced by the Dexion division of Acme Steel Co., and its light weight enables one man to roll a massive section, 15 ft high and 123 ft long, into place unassisted. Slotted bolt holes in the angles permit considerable latitude in the assembly of the scaffolding into various configurations.

The dock provides a catwalk around the plane, with finger piers extending between the engines. Metal grating serves as flooring for the walkways. Using specially-designed long-handled mechanical brushes with hose attachments, workmen can reach nearly all areas of the plane without leaving the catwalk. It had previously been necessary for men to walk around on the slippery surfaces of the planes, to do a thorough cleaning job.

Safety harnesses, suspended from cables strung across the trusses of the hangar, are no longer a "must."

After its regular 2000-hour overhaul at San Francisco, each of United's 186 planes gets a brightening treatment, with a chemical solution compounded to clean the aluminum skin by removing oxidation film. Between brightenings, the planes are washed down with soap and water once a week, at line stations, to remove loose grime. End

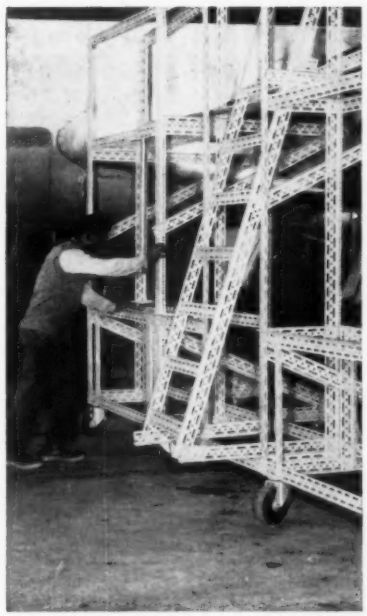
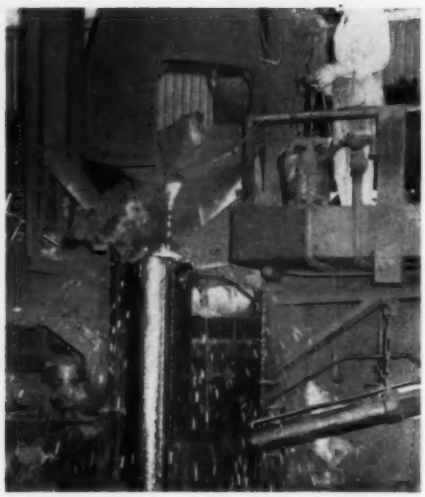


Fig. 2. Single workman can move entire dock. Entrance ladder is at center



Figs. 1 and 2. Left: Furnaces are tilted hydraulically to pour molten metal into water-cooled molds. Above: Sprays of molten metal are not uncommon during pouring and point up the need for a fire-resistant hydraulic fluid

Now, Chances of a Fire Are Reduced

Switch in Hydraulic Medium Was the Answer

TEN MELTING furnaces each pouring 1500 lb of molten metal at least once every hour represent a possible fire hazard. That is why the Wolverine Tube Division, Calumet and Hecla, Inc., took a long searching look at the alloy melting operation and decided to switch to a fire-resistant hydraulic fluid for safety to workers and protection for plant and equipment.

Formerly, conventional mineral oil was used as the hydraulic medium and it worked fine. That is, until the oil was exposed to molten metal or sparks. Just imagine what could happen when molten metal at 2300 F meets up with highly pressured oil.

Here's what happened in one of the fires the company experienced: The bottom of the furnace fell out and 2000 lb of molten copper poured down into the pit where hydraulic, electrical and air lines are intermeshed. The intense heat ruptured the hydraulic lines and a blaze flared up when the mineral oil ignited. The air lines tore open and compressed air fed the flames. Before the fire could be brought under control, all of the electrical equipment burned out. Furnace downtime, plus repiping, rewiring and replacement of parts, proved costly.

Fires Multiplied Troubles

Putting out such fires was a difficult task. Streams of water were more likely to spread the flames rather than extinguish them but only water could be used. Dry chemical extinguishers helped to put out the blaze, but the molten metal re-ignited the fire almost immediately. The only solution was to cool down the molten metal so that the fire could be blanketed.

Another problem was that if the smoke and flames were too intense for the worker on the casting platform, he would not be able to reach the pushbutton for the hydraulic pump motor. In that case, pressurized hydraulic oil continued to feed the fire until the oil in the reservoir was exhausted.

The hydraulic equipment is used to position the spout for pouring. It activates the trunnions which tilt the furnace. There are five hydraulic units in all, one unit operating two furnaces. The five tanks hold about 30 gallons of hydraulic fluid each, but all of the tanks are combined into a single system. When one unit is filled the fluid equalizes itself among the others.

The hydraulic units are equipped with vane type pumps rated at 1000

psi. The system is so arranged that if one unit breaks down, a series of valves can be opened to allow the use of another unit for furnace tilting. Even if four of the five hydraulic units became inoperative, the remaining pump would be adequate to tilt any of the ten furnaces. However, production would be slowed to a crawl since only one furnace at a time could be operated.

The fire-resistant hydraulic fluid selected by the company was Irus Fluid 902, a water-in-oil emulsion type fluid produced by the Shell Oil Company. Since its use, the company hasn't had a fire of any kind, even though the fluid has been exposed to molten metal many times. When such contact was made, the only noticeable effect was a cloud of steam. This "snuffer" action serves to douse flames before they have a chance to erupt.

Actually, the only materials now in the area that can burn are the dust and lint and possibly carbon that normally collects beneath each furnace—plus the graphited oil used to lubricate the copper ingot molds, but there's never enough of this oil present to cause a blaze.

Change-over was quite simple and involved no changes of seals, packings, O-rings, fittings or pump components. The important factor was to thoroughly clean out the hydraulic system. All of the former oil was drained out, lines were broken and the reservoirs wiped to remove dirt and possible contaminants. At this time the pump inlet screens were removed from the suction lines. Shortly after the system was charged with the fluid, an analysis was made to see if there was any of the old oil remaining.

Being a water-in-oil material, the water content of the fluid has to be checked periodically. The company laboratory mixes a solution consisting of 50 per cent ether and 50 per cent of fluid from the hydraulic system. Mixture is allowed to stand overnight before a check is made.

Water Content of Fluid

Occasionally, water content has run to 41 per cent which is considered close to maximum, but in the main, water in the fluid has remained at around 36 per cent. When reservoir make-up is required, the fluid is agitated to insure thorough mixing of the oil and water. "Taking it off bottom" of drum could possibly increase water content.

Because the fire-resistant hydraulic fluid is a bright yellow in color, leaks are much easier to spot.

Formerly, any leak was difficult to locate and quite often the leakage created pools beneath the furnace area. Serious leaks prevented proper tilting in some instances because of a drop in pressure on that particular furnace. The operator then had to shut down the hydraulic pump until the leak was located and repaired.

Now major leaks are spotted immediately by the spread of the yellow fluid. Minor leaks are easily traced and repaired as part of the preventive maintenance program which prescribes general repair each weekend. **End**

Fig. 3. Any leaks in the system are much easier to spot because the hydraulic fluid is a bright yellow in color

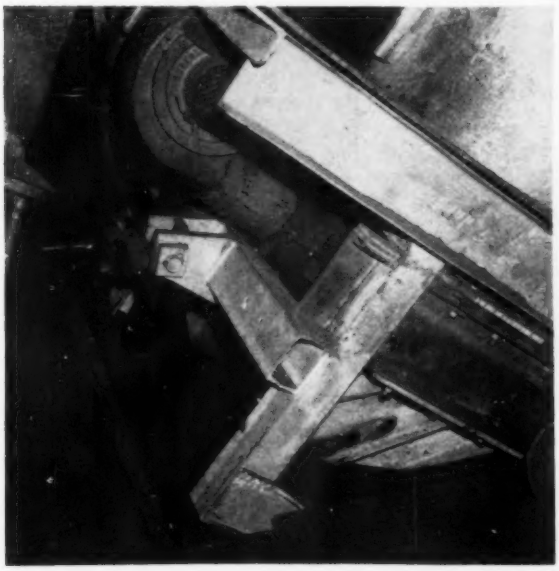


Fig. 4. Furnace in tilt position partially shows the hydraulically-operated cylinder which extends down to the pit below

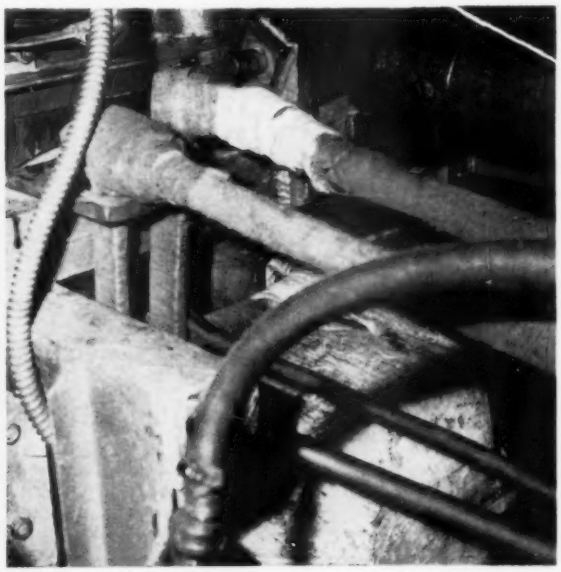


Fig. 5. View of the service lines located beneath the furnace. Formerly, fires caused extensive damage to equipment

How To Bend Electrical Conduit

Planning, Proper Technique Are Important Factors

By **WALTER JACOBY**, Maintenance Superintendent, I-T-E Circuit Breaker Co., Philadelphia, Pa.

TIME WASTED by electricians in guesswork when bending electrical metallic tubing and by pipefitters when bending hydraulic tubing can be minimized by following these suggestions.

Electrical metallic tubing shall be referred to hereafter as E.M.T. The procedures herein are applicable to the bending of E.M.T. and hydraulic tubing, when using any E.M.T. bender or tubing benders manufactured for these conductors.

E.M.T., also referred to as thinwall, is less than half the wall thickness of rigid conduit. It is physically easy to bend, light in weight, and more economical to install than rigid conduit, as no threading is necessary. In a short period of time, the proper use of hand and hydraulic benders brings a return on the initial cost of the benders, as time and money are saved in eliminating the manufactured fittings.

The economy involved in knowing how to bend correctly, and therefore quickly is proved by the cost of 45- and 90-deg manufactured elbows.

Work Layout. The first step in performing any job is planning. Wiring diagrams, if any, should be first referred to and the number of wires, wire sizes, and conduit sizes determined.

The routing of conduit is the next step to be considered. Conduit routes should take the path that provides the least number of bends, as the straighter the run the neater it will look.

Article 346—para. 3471 of the National Electrical Codes states, "A run of conduit between outlet and outlet, between fitting and fitting shall not contain more than the equivalent of 4 quarter bends (360 degrees, total), including those bends located immediately at the outlet or fitting."

Article 346—para. 3466-c states, "One conduit shall not contain more than nine conductors except as noted in Table 9 of Chapter 10."

Types of Bends. Bends most common to all jobs are: 1. offset. 2. elbow. 3. kick. 4. saddle.

Combinations or variations of these four bends will produce any shape run necessary in the field.

Making an Offset. The offset is used at every box where conduit is clamped. See Fig. 1. Offsets should be made as follows:

Step 1. Measure the bend from outside to outside. Lay out the bend as indicated in Fig. 1, assuming the conduit is ½-in. E.M.T., the offset 3 in. outside to outside, and 8½ in. long. Bending techniques are the same for all E.M.T. sizes.

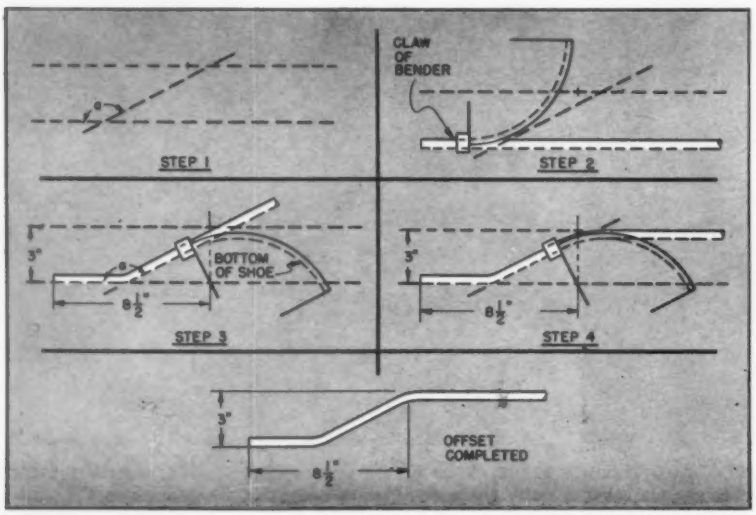
The bend is laid out on the floor with the desired angle drawn across the lines which represent the outside edges of the bend.

Step 2. The conduit is placed in the bender and pulled snug against the shoe. The bender and conduit are placed on the layout. Notice about half the diameter of the conduit protrudes outside the edge of the shoe radius. The shoe is held so that the conduit parallels the outside line of the offset and about half the conduit diameter away from the angle line drawn. The end of the conduit of course is lined up with the template so that nothing need be cut off when bend is complete. The offset will be the correct size and length when completed.

Imagine the claw of the bending shoe a fixed point. The E.M.T. does not move from the claw to the end. If you should hold the shoe and pull the conduit around it to the desired angle, it can fall nowhere but on the mark.

Pick up the bender, still holding the conduit snug against the shoe, and make the bend holding the bender to the floor with one foot. A

Fig. 1. Make offset layout on floor and set bender using lines for guidance



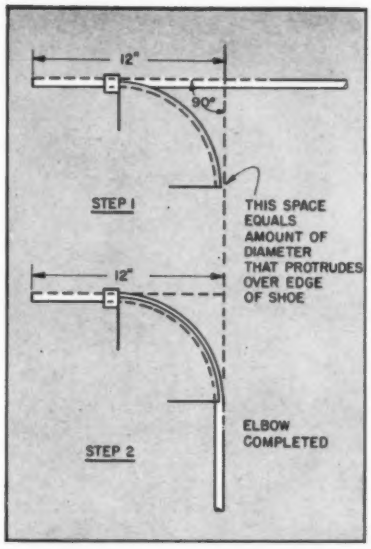


Fig. 2. An elbow bend is not involved

6-ft rule can be angled open to gage the angle when bending.

Step 3. The conduit is placed on the mark, the bender placed in reverse and the same procedure followed as in step 2. The claw position can be marked on the E.M.T. with a pencil in case it slips when picking up to make a bend. It is not necessary to line up on the template. Conduit is lined up with claw and pencil mark to restore to original position.

Step 4 shows the offset complete. There is no guesswork involved in this method. It is fast, accurate, and can be used with any manufactured bender, whether the bender be the hand, step-on type or the hydraulic type used for 1¼, 1½ or 2-in. E.M.T.

You may have observed by now, and this is important in making any type bend, that the tubing is sighted along the shoe at the angle the bend will be and at the outside line of E.M.T. when the bend is complete.

Making an Elbow. Referring to Fig. 2, you will notice the elbow is the easiest of all to make.

Step 1 calls for an elbow 12 in. long from end to outside. Mark off 12 in. on the E. M.T. Place the conduit and bender on the floor. Snug up the bender. Sighting at 90 deg to the floor and lining up the mark so it protrudes about one half the diameter of tubing beyond the outside edge of the shoe, puts you in position to bend.

Step 2 shows the bend made and it fits the template. It should be noted here that no template is needed to make a quarter bend, but is here mentioned for the purpose of explanation.

Making the Kick. Simply place the conduit and bender on the floor. A 6-ft rule is stood vertically on the floor and the bend stopped when pulled to the depth, shown as X.

If a kick must have a certain length and specific angle, the bend can be laid out as in Fig. 3 and worked from the elbow to the shoe, as indicated in Fig. 1, step 2 from the end of the conduit to the shoe.

Bending a Saddle. A saddle calls for a combination of a kick and offset bending operations. If the following procedure is followed, a perfectly symmetrical saddle will result:

Step 1 calls for a saddle 3 in. deep measured outside to outside for depth.

The center line of the saddle is 12 in. from the end of the E.M.T. Lay out the saddle on the floor as shown in Fig. 4, step 1. Mark D is placed on AB 12 in. from A. Lay out a line DC perpendicular to AB. DC is the center line of the saddle. DC is 3 in. long, which represents the depth from outside to outside.

Step 2 shows the first bend to be made. After making the bend in step 2, the conduit is placed on the template so that ED is equal to DF. We now have two quadrants that are congruent. Mark these to each side of tubing as E and F.

Step 3 shows how the second bend is made. The same procedure is followed as in making the second bend of the offset. If the bend is too great, point F will fall below AB. If too shallow, F will fall above AB.

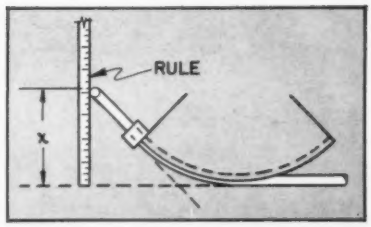


Fig. 3. Check kick on floor with rule

If symmetrically bent, mark F will fall on line AB.

Step 4 shows the final bend, and a perfectly symmetrical saddle results.

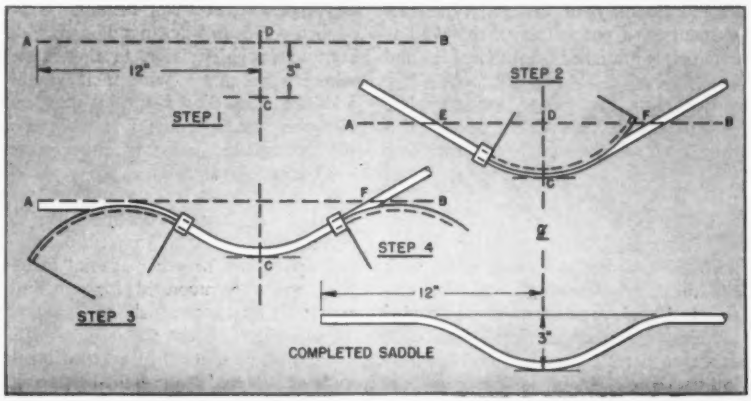
It should be understood that the procedure using an hydraulic E.M.T. bender is exactly the same, except the straight or stationary shoe is represented by the floor in hand bending.

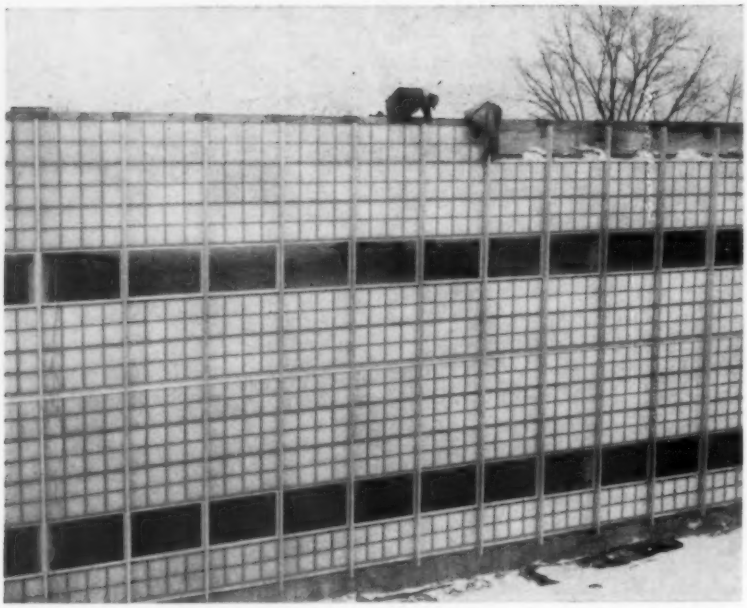
A series of bends should be started at one end of a length of conduit and be made progressively toward the other end and finally to its completion.

E.M.T. Characteristics. It can be purchased made of mild steel or aluminum. Some of the characteristics of aluminum are: 1. It is non-magnetic; voltage drop is lower than in magnetic conduit, single conductors can be installed in aluminum as it is non-magnetic. 2. Aluminum resists corrosion and will not discolor adjacent surfaces. 3. It is light in weight compared to iron or steel conduit.

Thinwall can also be purchased in Everdur. Everdur, composed principally of copper, is a non-magnetic copper silicon alloy which provides great strength, high corrosion resistance, high fatigue limit, and exceptional ductility. **End**

Fig. 4. A combination of kick and offset operations is used to make a saddle





Erection of this building's exterior wall was not hindered even in below-zero weather since it was possible to assemble all the units with a screwdriver

Glass-Curtain Wall System Is Screwdriver-Assembled

A NEW CURTAIN wall system which meets the strict requirements of such construction while allowing complete flexibility of design was announced recently by Owens-Illinois Glass Company, Toledo.

Called "The Thinlite System", the curtain wall is a complete enclosure element with both exterior and interior finish, insulation, structural independence and a means of attachment to the building. It provides for controlled daylight and allows complete freedom in individuality of design. When its elements are put in place, the wall is completely finished, both inside and out.

Preceding design of the complete system, the manufacturers developed a thin, lightweight, daylight-controlling glass unit for use in the pre-fabricated curtain wall system.

These glass units are hollow, 2 in. thick and 12 in. square. They are assembled in panels at the plant with the aid of quick-setting cementing material. Panel perimeters are extruded aluminum which interlock with each other, to permit easy and quick installation. The system is designed for either a four-foot or five-foot horizontal module. Standard panels are two feet high and either four or five feet wide.

The basic daylight panels are available in three colors—a soft white for general use; a cool blue-green for severe sunlight exposures; and a golden sunlight yellow for non-sun exposures. Basic daylight panels are supplemented with colorful ceramic-face glass panels, vista panels (for vision), decorative glass unit panels, porcelain and other special type panels.

Window panels can be either fixed or projected and arranged in any design to provide vision to the outside where necessary. Each panel, whether a daylight unit or a special one, carries the same perimeter so that it is interchangeable with any other panel.

Thinlite ceramic-face glass panels are hollow units with exterior faces finished in almost opaque, fired-on ceramic color in a variety of hues. Like porcelain or other special paneis, they are recommended for non-light transmitting areas such as spandrels or for other veneer use.

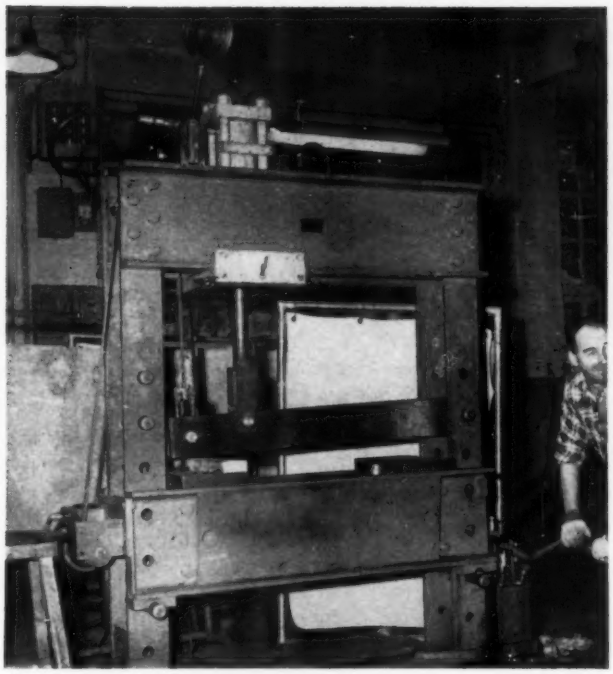
Panels are erected in vertical stacks and are bolted to vertical extruded structural struts, spaced four or five feet on centers. Included is a line of aluminum parts such as sill, jamb, head members and connectors.

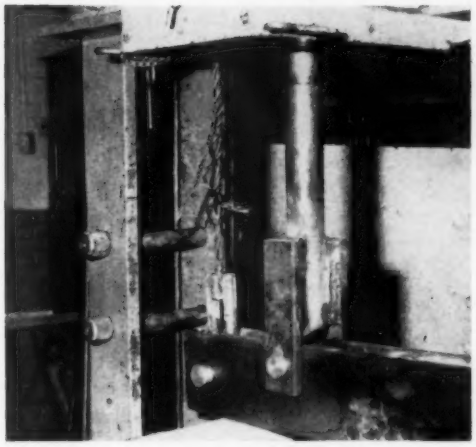
All aluminum struts come to the job carrying their own gaskets. They are so designed that when panels are bolted into place, gaskets are compressed and automatically form a weather-proof vertical joint. Struts may be used either on the inside or outside of the building.

Vertical batten strips are fitted with their own special attachments and carry gaskets which, when used in combination with a strut, form a vertical weather seal on both sides of the panel.

Thinlite panels support nothing but their own weight, and one of their basic functions is to keep out the weather. Neoprene is used as the gasketing material. The gasketing system is so complete that the only caulking necessary is around the perimeter of the entire opening. **End**

Stainless steel bolt and clip assembly is used to fasten the panels to the struts





Left: Hydraulic press with special lever arm has been adapted for testing wire rope sockets. Above: Close-up of socket just at the moment of failure

Plant-Made Tensile Tester—

Checks Wire Rope Sockets and Other Plant Equipment

By L. McWILLIAMS, Maintenance Supervisor, Shawinigan Water and Power Co., Quebec, Canada

FOLLOWING THE failure of a wire rope cable socket, it was natural that we would be concerned with the workmanship of the joints. Although a skilled workman was instructed in the art by an old cable-splicer, we were very much interested in learning just what the sockets would take.

Until this problem came up, tensile and breaking strength tests were made in our little lab on a special beam, using a dynamometer as the measuring device, and an ordinary puller for applying tension.

This procedure, although satisfactory for small-capacity samples, presented certain hazards due to the stored energy of the dynamometer spring being released when breakage of a sample occurred. Also, the maximum possible tension with the setup was only five tons, which is insufficient for handling chain, wire rope, links and sockets.

To solve our problem, an hydraulic press in the machine shop was employed. A lever arm was made and used in conjunction with the press. This provided a safe, adequate and easily controlled means of performing the required tests.

The special beam was so arranged that a gage pressure of 127.5 psi gave a tension of one ton on the sample under test. A graph provided a simple means of converting gage readings into pounds or tons. A calibration test was made with a dynamometer to verify the calculated figures.

Although the device was designed to determine the quality of workmanship and the "safe load" of the zinc sockets, we went a step further and carried the sample test on to destruction. It is interesting to note that in no case did a socket fail. Tests were made on specially prepared sockets, 1¾ in. long, with ½-in. 6/19 improved plow steel wire rope. See Table I.

Table I. Results of brush-out socket test

Sample	Breaking Load
1 and 2	21,300 lb
3 and 4	23,600 lb
5 and 6	23,500 lb

Note that the breaking strength compares closely with the 11-ton figure given by the manufacturers of this grade of wire rope.

Naturally, the device is suitable for other testing applications. There, of course, is room for improvement. A new zero-to-3000 psi gage is on order with intermediate graduations of 100 psi and a tell-tale pointer. This will permit tension readings to within 300 lb, and a maximum capacity of 23.6 tons. Of further interest is the fact that the entire press frame was fabricated in the shop; only the hydraulic press was purchased.

There are two recommended

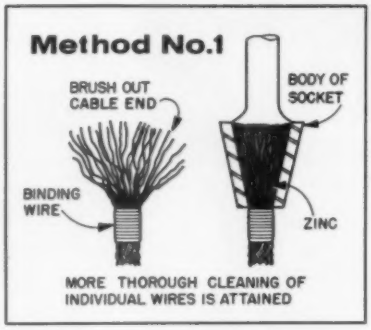
methods employed when socketing wire rope, both approved by the A.S.A. Code. One is the "flared-out" or "brushed-out" method in which all the individual wires are separated forming a loose brush-like end to the cable.

Exponents of this method recommend that the wires be cleaned with gasoline or naphtha, then dipped in a 50 per cent solution of muriatic acid and water. The cable end is then dipped in boiling soda water to neutralize the acid. After preparing the cable, zinc is used as the filling or binding metal.

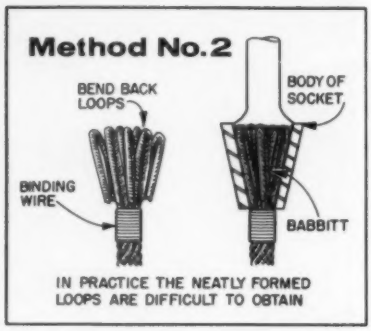
The other method is to bend each of the six strands of the cable back to form loops which, when inserted in the socket, will, under tension, act as a lock. Cleaning is done with gasoline only. Babbitt is used as the binding metal.

The flared-out method was used in all the tests described earlier, and was later applied to the actual re-socketing of some elevator cables.

Since safety is a major consideration in such work, we decided to make some tests on sockets prepared by the second or loop method.



"Brush-out" method of socketing rope



Bent loop method of socketing rope

Every step of the preparation was carefully followed, to eliminate as many construction faults as possible.

Table II. Results of bent loop socket test

Sample	Breaking Load
Babbitt filler	9,600 lb
Lead filler	7,100 lb
Zinc filler	13,400 lb

Results of the loop method test on our tensile tester are shown in Table II, above.

Upon examining the sockets after failure it was noted that the binding metal did not penetrate into, nor around, the individual strands of wire as was the case with the "brush-out" method, also, there was a tendency for the loops to unfold and straighten out under stress.

Attention is directed to the fact that with the brush-out method we were able to take the cable to destruction, while with the loop method, the socket failed at approximately one-half the breaking strength of the cable. **End**

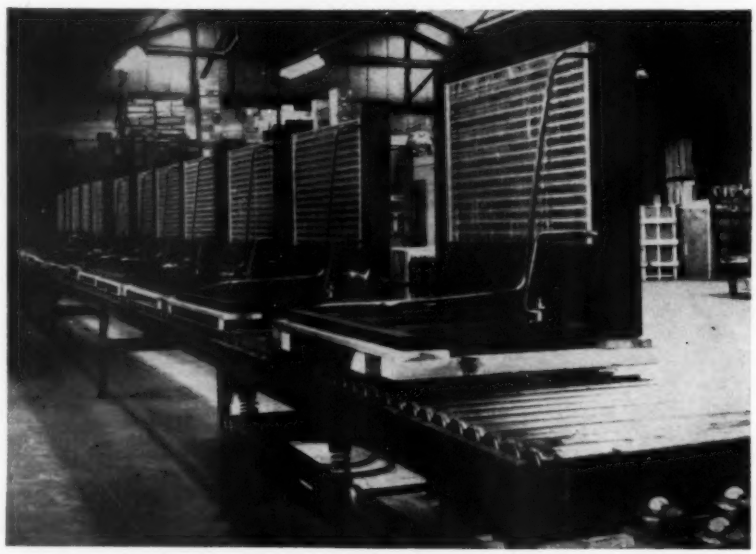
Soldered Joints Are "Shake-Tested"

IN THE PAST, air conditioner manufacturers were plagued by an occasional faulty connection that would show up after the units were installed. The soldering flaws were strong enough to stand up under the 400-psi pressure test, but would loosen under the jolts of shipping, permitting the refrigerant to escape.

One midwest manufacturer has solved this problem by installing a vibrating roller conveyor section in the assembly line on which air conditioning units are fabricated.

This vibrating section, fabricated by The Cleveland Vibrator Company, is located ahead of the pressure test booth. Each unit is stopped on the vibrating section for one minute of violent shaking. This one minute of banging is enough to shake loose any faulty connections, which will then show up in the pressure test.

The vibrating section is made up of a standard roller conveyor, top and base. The roller top is supported by four stiff coil springs, which serve to amplify the vibration and also to prevent the transmission of vibration to the floor. A vibrator, bolted to the conveyor top, operates on 80-lb pressure and delivers 1000 blows a minute. **End**



Vibrating section, foreground, gives each air conditioning unit a violent shaking for one minute so that any faulty connections will show up in the pressure test

Part 2 of Two Parts

Do You Have Abrasion Problems? —Wear Problems?

By FRANK C. ROE, Senior Engineer—Technical Services, The Carborundum Co.

THE FIRST PART of this two-part article on abrasion-resistant materials described what is presently available in ceramic wear-resistant materials. It also described their application to equipment to aid in its resistance to fine solids impingement in air or gas suspension. Part II, presented here, describes the application of these materials in resisting: 1. fine solids impingement when these solids are suspended in a liquid, and 2. direct abrasion from dry solids.

Fine Solids Impingement—Liquid Suspension

1. Pipe lines, launders, bends—Successful use of ceramic type wear resistant linings in this area of use extends back many years to the development of salt glazed vitrified clay. In a great many cases corrosion resistance is of more importance than erosion resistance although both corrosion and erosion complement each other to create severe wear problems.

For severe wear conditions, the use of ceramic bonded silicon carbide, silicon nitride bonded silicon carbide and fused cast refractories has been found practical during recent years. These materials must, however, be encased since they are permeable to liquids under pressure. One company has even developed a direct process for lining steel pipe with a fused cast material, thereby simplifying the problem of connections as well as structural assembly.

2. Hydro-cyclones — Classification and/or separation of solids suspended in liquid is accomplished very efficiently with the type of equipment illustrated by Fig. 4. It will be apparent that the same centrifugal force that classifies or separates the solids, causes such solids to abrade the lining. Lining wear frequently is aggravated by a corrosion factor when the liquid is an acid.

In general, small size units and high velocities are the rule so that rapid cyclone deterioration is experienced unless good linings are employed. For very small self-contained one piece hydro-cyclones, used to separate relatively fine, soft solids, chemical porcelain has been employed extensively. Larger units for more rugged service require a liquid-tight fabricated housing lined entirely or in part with regular ceramic bonded silicon carbide. The efficient and proved design shown in Fig. 4 is made up of a lower one-piece underflow cone of ceramically bonded silicon carbide which is flange-connected to the main cyclone above. The main body, inlet and overflow are all subject to less severe abrasion and are of rubber lined welded steel construction.

For severe conditions, silicon nitride bonded silicon carbide has been utilized in these hydro-cyclones. The part for which it is employed most frequently is the "valve" or solids underflow orifice at the bottom of the unit. It is obvious that to maintain a uniform degree of ore classification, for example, the flow must be controlled with reasonable accuracy. To accomplish this efficiently, the orifice must retain size and shape for long periods of time.

3. Spray nozzles—Generally, spray nozzles are for clear liquids. It is well known, however, that erosion is severe under many conditions so that the application can, logically, be discussed in this article. When solids are in suspension, wear is terrific so that the most abrasion-resistant material is to be desired.

For a majority of applications, bronze and other low-cost alloy nozzles are well adapted and provide reasonable life. But when stainless steel is indicated to resist combined corrosion and erosion, ceramic bonded or silicon nitride bonded silicon carbide nozzles frequently will be even more economical and will last much longer.

Both of these materials have a definite advantage for this use over other ceramic type bodies in that thermal shock often is involved. Silicon carbide is best able to absorb rapid temperature change because of its high thermal conductivity and low thermal expansion characteristics. Figure 5 shows two small silicon carbide nozzles. These have replaced alloy nozzles and, although their first cost was higher than that of the alloy nozzles, the actual cost, based on comparative life spans, was but a small fraction of the cost of the alloy units.

An example of how a ceramic type material may provide superior service

Fig. 4. This is a one-piece underflow cone of ceramically bonded silicon carbide which is flange-connected to the main hydro-cyclone above it. Solids in suspension tend to abrade hydro cyclones as they are thrown to the outside of the vortex by centrifugal force

under severe conditions is illustrated in Fig. 6. Small stainless steel sprayers for jetting high pressure water and steam into catalytic gasoline cracking units wear badly in from 2 to 4 months as illustrated on the left. In contrast, silicon nitride bonded silicon carbide nozzles show no more wear after 7½ months service than the specimen on the right.

4. Centrifugal slurry pumps—It is obvious that the main parts of centrifugal pumps are subjected to the most severe conditions of abrasion; particularly when the liquid is acid—and that is often.

The latest improvement in ceramic type pump parts to be reported is the use of silicon nitride bonded silicon carbide material. A centrifugal pump suction cover as illustrated in Fig. 7 was among the earliest parts made having a practical and commercial application. Before the picture was taken this cover was used continuously for about ten months on a pump that handles a very abrasive acid slurry. There was no visible wear and the cover was put back in service.

Direct Abrasion—Dry Solids

1. Skid rails—There are many types of furnaces used for heat treating of heavy steel and steel alloy billets, bars, plates, pipe, etc., in which the produce must move (slide) across the hearth. To protect the refractory hearth lining against such severe direct abrasion, rails of ceramic bonded silicon carbide are installed with the top edge slightly above the surface. These furnaces operate at temperatures up to 2400 F so that the application is a "natural" for a material that has the combined ability to continuously withstand elevated temperatures and severe abrasive action.

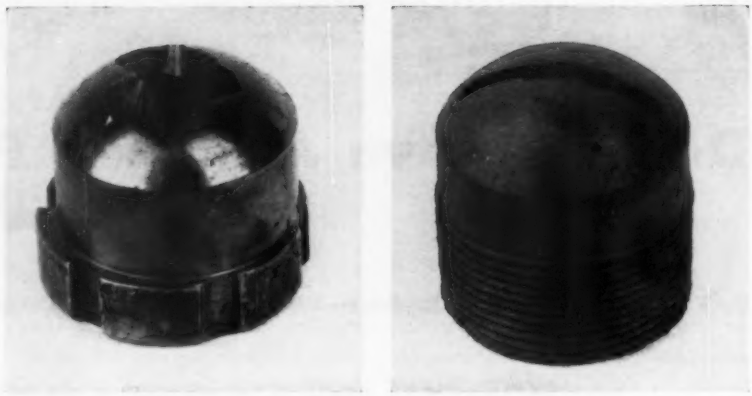


Fig. 6. Left: Stainless steel sprayers for jetting high pressure water and steam into catalytic cracking units wear badly in from two to four months. In contrast, silicon nitride bonded silicon carbide units, right, show no wear after 7½ months

2. Chute linings—Ceramic type materials, usually in the form of simple brick shapes, have been widely used for a great many years to extend the life of chutes handling dry abrasive materials. While steel chutes are low in cost and a steel chute form must still be used to retain a lining of any other material, the elimination of frequent repair work and/or shut-down time invariably is an attractive proposition.

One of the most extensive uses of ceramic type materials in this field has been in coke chutes. Hard burned clay brick, ceramic bonded silicon carbide and fused cast materials all have been used successfully, depending on conditions. Figure 8 illustrates a spiral chute in a coke screen house that is lined with silicon carbide.

Two important factors affect choice of ceramic type chute linings for handling of coke and other highly abrasive materials such as sintered iron ore, pyrites, hematite, taconite, and other ores:

1. The size or weight of particles being handled and the resulting impact on the chute lining. Where impact is severe, the bonded type materials will wear rapidly because of minute continuous fracture of ceramic bond material. In contrast, fused cast liners will withstand much greater impact since there is no bond to fracture.

2. The slope of the chute. If chutes must be flatter than about 35 deg from horizontal, ceramically bonded granular material such as silicon carbide may not be practical because the coefficient of friction between it and coke or other materials sliding on it may be too high.

A lining of basalt or a fused cast material that will wear with a higher polish is indicated for such flat chutes. If moisture is present, a smooth wearing material is made all the more necessary.

Superior abrasion resistance, plus greater versatility, has led to general popularity of fused cast ceramic linings over bonded silicon carbide during the past year, even though cost is higher.

As suggested earlier in this article, a full scale test under the actual conditions that exist will provide the final answer of practicability and ultimate economy.

3. Bins, hoppers, transfer or skip car lining—Ceramic lining for equipment in this category has been limited in use because special shapes (at higher cost) frequently are required to supplement standard brick shapes and

Fig. 5. These are two small spray nozzles that have replaced alloy nozzles in severe erosion service. Made of silicon nitride bonded silicon carbide, the first cost of these nozzles was considerably higher than the first cost of the alloy nozzles but their much longer life made the comparative cost of these silicon carbide nozzles but a fraction of the cost of the alloy nozzles originally installed. Silicon carbide is able to absorb rapid temperature changes because of its high thermal conductivity and low thermal expansion characteristics thus is ideal for hot liquid use

thus secure a mechanically rugged unit. In spite of somewhat higher unit area cost, many ceramic type linings for equipment of this character have proved successful.

4. Mill linings—Ceramic materials have been used for lining of ball or pebble-type grinding mills ever since that equipment became available to industry. This application, of course, requires an extremely abrasion-resistant material for long period use, but usually there is a corollary factor. The rate of wear must be so insignificant that contamination of the product being ground is nil. Recently, high fired, sintered alumina material has been developed and used successfully. It is reported that such liners will last from two to three times as long as porcelain liners.

Fig. 7. Cover for a centrifugal pump that handled a highly abrasive acid slurry. This cover, made of silicon nitride bonded silicon carbide, shows no visible wear; it was put back into service

5. Grinding media — The development of grinding balls and pebbles of spherical or natural shape has closely followed the development of mill linings. While natural flint balls have been used from the beginning, hard vitreous porcelain balls have proved increasingly popular because of purity, uniformity, and long service. Sintered alumina balls have entered the field also and show increased life.

6. Feeder table covers — Rotating horizontal tables, used extensively to feed materials uniformly from bins to conveyors or to processing equipment, frequently are subject to excessive wear and continual replacement. It has been found that under some conditions, ceramic bonded silicon carbide is peculiarly adapted to the facing of such feed tables.

Silicon carbide is not only excellent in resisting the wear, but it has an unusual "bonus" feature for this application. It does not wear smooth, i.e., with a polished surface. The relatively high coefficient of friction becomes advantageous with proper control of bin feed and table velocity to give extremely good uniformity of product feed from the table. When tables wear to a polished surface, it may be difficult to secure uniform product feed.

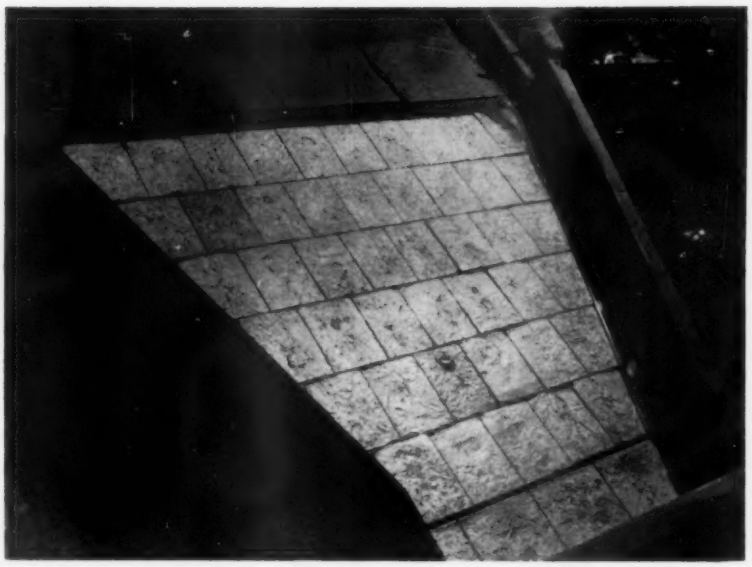


Fig. 8. Spiral chute in a coke screen house. Chute is lined with silicon carbide

Small diameter feed tables can be faced with one-piece silicon carbide discs. For diameters greater than say 36 in., it is practical and economical to utilize a disc for the center of the table with standard key or circle brick shapes extending in courses to the peripheral retaining angle. Facing with plain straight brick is lowest in material cost, but requires difficult and costly field cutting of peripheral brick to fit the various portions of the curve.

7. Conveyors—It is apparent that both the housings and the screws or flights of conveyors are subject to severe wear when handling abrasive materials. Wear-resistant steel and other alloys are used extensively for this service where the equipment generally is subjected to rough usage and varied stresses. Where the material to be handled is corrosive in nature as well as abrasive there is now sufficient test experience to indicate that silicon carbide linings and conveyor "shoes" will prove most economical in the long run. **End**

". . . or . . . we could leave it that way and enter it on the print as an adjustable support!"

Fig. 1. Weldor uses Fillerarc in test. Booth also has a-c, d-c and Heliarc equipment

Test Booth Qualifies Weldors

It's Useful for Testing Equipment and Materials, too

SPECIAL WELDING BOOTH has been in use for a year now at the Kenworth Motor Truck Company plant in Seattle, Wash., and has been accepted by management and workers alike.

The booth has three primary functions: 1. testing of weldors before using them on a production job; 2. testing of welded production parts; and 3. testing of welding equipment and materials before purchase.

Use of the booth has resulted in better company weldors, improved quality of welding and quality control of such items as electrodes and filler wire, which are thoroughly inspected and tested in the booth before they are bought for use in production work.

The booth has been of value to the weldors, as well as to the company. Each company weldor is issued a qualification card which shows what welding processes for which he has been tested and certified to use. This card, which the employee carries in his billfold, is official recognition of his status. As such, it has a certain prestige value which is recognized by the weldors. Also, the employee is allowed to retain the card when his employment with the company is terminated. It serves as a valuable recommendation and reference for future employment.

Must Pass Test

Before a weldor is hired by the company, he must pass a qualification test in the booth on the type of welding he will be doing in production work. After passing the test he is issued two items. One is a stamp bearing a letter of the alphabet which will identify his work. A weldor is required to mark all his work with the individual letter issued to him. This system results in immediate identification of all welding jobs.

The other item issued to the weldor is the personal qualification card. The back of the card is marked to show what types of welding the employee is qualified to perform. The front of the card bears a card number, date, employee's name and the signature of the supervisor of quality control.

When the weldor qualifies for additional welding processes, the card is punched to indicate his new qualifications.

This card assures the company of competent welding on production parts. If a weldor's card doesn't indicate he is qualified for a specific job, he can't be used on it. Before he can be directed—or permitted—to do the work, he must pass the required test in the welding booth.

Under the company's program, weldors may be required to requalify for welding processes every year. A qualified weldor may be asked to requalify for a process in a shorter period if he hasn't used the welding

process within the previous three months or if an inspector or supervisor finds the weldor is not producing satisfactory welds.

The welding booth is equipped with a-c, d-c, and Heliarc welders, also a General Electric Fillerarc welding machine, all of which are used for testing employees in all phases of welding. A wide variety of welding equipment is used in the plant's production shops.

Qualify for Four Methods

Qualification tests are given for four welding methods: 1. metal arc process; 2. oxygen-acetylene process; 3. inert-gas-shielded metal arc process; and 4. inert-gas-shielded tungsten arc process. The weldors also are checked out on four positions in these processes—horizontal, vertical, flat and overhead.

Qualification on groove joints automatically qualifies a weldor to weld the same size of fillet joints in the same position. All weldors are required to pass horizontal and vertical groove tests.

Failure to pass both horizontal and vertical tests with the metal arc process makes a weldor subject to further training. Failure to pass a test for a specified process will make the weldor subject to reassignment to more suitable work.

Standards of performance on tests are based on the American Welding Society qualification tests.

Basic procedure of tests includes fabrication of a sheet metal box six inches long, four inches wide and four inches deep. The thickness and type of metal used are determined by the nature of the test being taken.

First the box is tacked together. Then it is mounted, in a horizontal position, on a support rod. The box is not moved from this fixed position during the rest of the welding operation.

After the box is completely welded, a quarter-inch hole is drilled in one end and a quarter-inch pipe nipple, made of the same material as the box, is welded to the opening. Welding of the nipple, also, is finished while the box is in the fixed horizontal position.

The pipe nipple is used for attachment of an air hose to test the box for leaks.

This test method calls for horizontal, vertical, overhead and flat welding. The weldor taking the test is required to set the welding machine for the correct heat range needed for the job.

To pass the box welding test, the following standards must be met:

1. There may not be any cold laps.
2. The base metal may not be undercut along the edge of a weld.
3. No weld metal may fall through, causing icicles.
4. Welds must be smooth, uniform and free of surface defects such as cracks, voids, slag inclusions, excessive spatter and gas holes. Welds must blend smoothly into the parent metal.

After the box passes visual inspection, including x-ray examination for cracks and porosity, it is tested for leaks. The box is submerged in water and subjected to an air pressure of five pounds per square inch. Any leak will cause the weldor to fail the test.

Finally, the box is sawed in two so that it can be checked for icicle formation.

The box is not used for all welding tests. Plates and other forms of metals are used to test a weldor's ability to work on materials such as structural steel, stainless steel and structural aluminum.

If a weldor fails to pass the test for a certain welding process, he is permitted to take the test again at a later date. The testing program is designed to encourage, rather than discourage, employees. Its primary purpose is the raising of production quality by having each welding job done by a man qualified to do the work.

The welding booth isn't used for training employees. But the company encourages its weldors to learn and qualify for welding processes they aren't familiar with. The company will even reimburse an employee for the cost of attending a vocational school to improve his welding knowledge and technique.

Records of all testing procedures are kept on file in the welding booth. The information is recorded on two forms.

One is a "weldor's qualification" form. This shows the weldor's performance on structural steel tests. The other is a "welding test data" form. This is used for all other tests. On the bottom of this form are noted the results of the test and the rating given the weldor's performance, such as good, average or failure.

Copies of these forms make up the company's record of the entire operation of the welding booth.

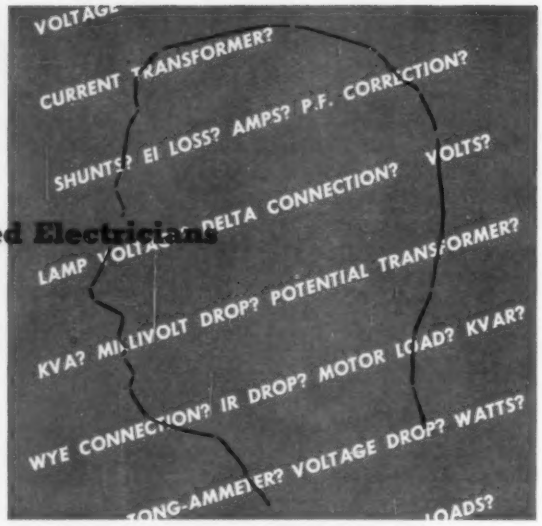
Before the company began using the welding booth, it had thought some weldors might oppose its use. But there hasn't been any opposition. Weldors are proud of their qualification cards and the official recognition of their work. And the company is proud of the improved quality of its products. **End**

Fig. 2. Proving ground for weldors is fabrication of box mounted on rigid support

INSTRU-MENTALITY

Part II

Designed To Test Your More Advanced Electricians



By **WILLIAM A. WEIBEL,**
Curtis Lighting, Inc., Chicago, Ill.

What about a do-it-yourself voltage multiplier?

Yes, those could be constructed quite easily with the use of simple parts. For a permanent, accurate device, the resistors and assembly should be capable of carrying the resulting current and dissipating the resulting heat. With resistors of known value the voltage ratios of the assembly could be easily determined and marked. Fixed value resistors with ceramic coating, for example, are readily available and could be easily assembled into a safe, compact, portable unit.

For a temporary device, incandescent lamps and porcelain, base-mounted sockets could be utilized, Fig. 10. The sockets could be secured to a non-conducting base and electrically connected in series, using large conductors.

For example, a single range, 0-150-v voltmeter could be used with this simple device to read 480 volts if four sockets and lamps were used. Reading the voltages across each of the four lamps would establish the value of the total applied voltage.

For convenience, ratios could then be determined if other applied voltages were to be measured. The chief virtue of such a device would be the ease with which it could be constructed from readily available parts. Its accuracy would be sufficient for most applications but would be largely dependent on the care used in reading the voltmeter and in computing the results.

How is voltage drop measured across suspected poor connections?

A voltmeter is used in any case where a voltage difference exists or is suspected to exist between two points in a conducting system.

In the case of a suspected poor connection, as for example in a bus system, a voltage reading would be taken as shown in Fig. 11. Here, the voltage difference is directly proportional to the product of the current and resistance between the two points. Ohms law expresses this as E = IR.

From this relationship it is seen that a poor connection, with corresponding high resistance, would reveal itself by a voltage reading made across such a connection. If the connection is clean, tight and therefore of low resistance, the voltage difference will be very small.

Would a sensitive meter like a millivolt meter be required for measuring voltage drop across suspected poor connections?

Yes, in most cases the drop would not register unless a sensitive meter is used. The importance of correcting a voltage drop of only a fraction of a volt is emphasized if we recall that a poor connection, with correspondingly higher resistance than other connections in the system, results in excessive heat generation at that point. The heating effect in any electrical circuit is directly propor-

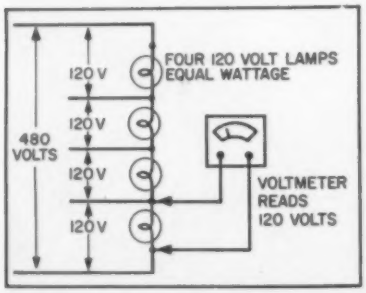


Fig. 10. Read high voltages by summing voltage drops of series lamps

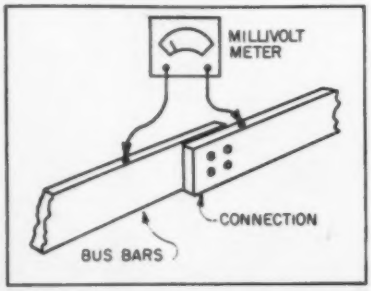


Fig. 11. Determine watt loss in hot bus connections by checking voltage drop

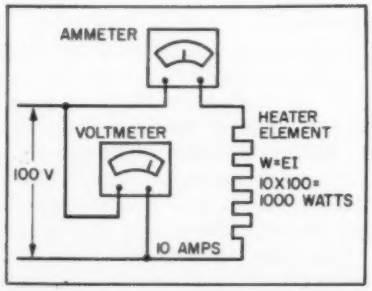


Fig. 12. True power or watts is product of voltage and current on d-c circuits

tional to the product of voltage and current or W = EI.

A bus bar connection carrying 4000 amperes with a voltage drop of 1/10 volt would result in 400 watts heat loss at the connection. Obviously it is important to detect and minimize the resistance of connections so as to decrease the voltage drop.

How is voltmeter sensitivity expressed?

In ohms-per-volt. For example, a single range-voltmeter having a total resistance of 15,000 ohms and 150 volt maximum scale reading would be said to have sensitivity of 15,000 divided by 150 or 1000 ohms-per-volt. Many voltmeters are available with sensitivities of 1000-ohms-per-volt. Higher sensitivities of 5000 to 20,000 ohms-per-volt are also available.

What is the significance of such sensitivity figures?

They indicate the degree of response of the instrument with passage of current through the instrument. The voltmeter having a relatively low sensitivity of 100 ohms-per-volt requires 200 times the current that another voltmeter of 20,000 ohms-per-volt sensitivity requires for the same operation.

In what applications would the low sensitivity instrument be acceptable?

In applications where an instrument of simple, rugged design could be used and where the relatively large voltmeter current drawn from the circuit being tested would not be objectionable. For example, such an instrument would be suitable for portable application in plant power circuits where the current drawn would not materially change the voltage being measured.

In what applications would a high sensitivity instrument be required?

In any circuit where the current drawn by the voltmeter would materially change the voltage being measured. A high resistance, vacuum-tube circuit, for example, would require the use of a high sensitivity, low current drain voltmeter.

What instruments are required for measurement of power?

Usually a wattmeter is used, but a-c power may also be measured by means of simultaneous readings of voltage, current and power factor.

If a wattmeter is not available, how may the other instruments be used to measure power?

Power is directly proportional to the product of simultaneous values of voltage, current and power factor. W = E times I times p.f. For example, the electric heater element, Fig. 12, operated on direct current would be rated 1000 watts if a voltage of 100 volts would result in a current of 10 amperes. On direct current, the power factor would be unity.

In the case of equipment on alternating current supply, true power input would require determination of power factor. If, by use of a power factor meter, this was found to be 0.9, and readings of voltage and current were, respectively, 220 and 15, the power input would be W = 220 times 15 time 0.9 = 2,970 watts.

How does a wattmeter measure electric power?

A wattmeter contains fixed and moving coils, Fig. 14, which, when connected to load current and load voltage, respectively, responds to these simultaneous values and indicates power. Separate determination of power factor is not required as the placing of coils within the instrument and the spring loading of the moving coil is such that the instrument can be calibrated directly in watts or kilowatts to indicate true power.

Care must be taken so that the instrument, Fig. 15, is not overloaded. This obviously is true of all instruments but many instruments respond to only one input value and therefore are more easily protected. The wattmeter requires additional care in its use as it responds to two input values, voltage and current, and is calibrated to indicate a third value, power.

The instrument may be loaded to a point where only a small value of power is indicated but either the voltage or the current coil could be overloaded. It is important to observe the current and voltage ratings before connecting the instrument and, preferably by continuous readings of current and voltage on separate instruments, make sure that these ratings are not exceeded.

How may the range of a wattmeter be extended?

By the use of instrument transformers on a-c circuits and voltage multipliers and shunts on d-c circuits. Circuit voltages and currents, in excess of the wattmeter ratings, may be stepped down or matched to the wattmeter. Alternating current instruments are generally standardized at 120 v for the potential circuits and five amperes on the current measuring elements.

Fig. 13. Voltmeter and ammeter show simultaneous values of voltage and current to determine watts flowing in d-c line

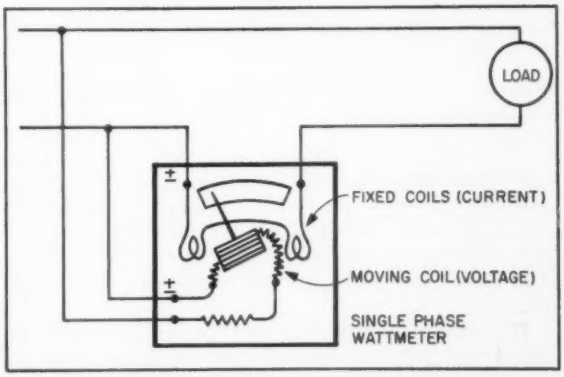


Fig. 14. Wattmeters have both current and voltage measuring elements in one case to simplify power measurements

What multiplying factors would apply for a wattmeter rated five amperes and 150 volts with a current transformer rated 400 to 5 and potential transformer rated 600 to 150 volts?

The current transformer rating of 400 to 5 represents a nominal ratio or multiplying factor of 80. The potential transformer rating of 600 to 150 represents a nominal ratio of multiplying factor of four. In other words, every ampere flowing in the current coil of the wattmeter represents 80 amperes flowing in the circuit being tested.

Similarly, every volt across the potential coil of the wattmeter represents four volts across the circuit being tested. Therefore, a reading of 200 watts on the wattmeter would represent a power of 200 times 80 times 5 or 80,000 watts.

How can power in a three phase circuit be measured if only single phase wattmeters are available?

In three-phase, three-wire circuits, two single-phase wattmeters would be required connected as shown in Fig. 16. In three-phase circuits with a neutral wire, carried along with the phase wires and with some loads connected from phase wires to neutral wire, three single-phase wattmeters would be required connected as shown in Fig. 17.

Note that with the current coil of a wattmeter connected in a given line wire, the potential coil of that meter should be connected to that same line wire and to a wire that is not connected to the current coil of any wattmeter. Note also that the loads need not be balanced.

With wattmeters connected as shown, true total power is the algebraic sum of the wattmeter readings. Negative readings can occur with certain conditions of load power factor. If one wattmeter should read backwards when power is applied to the circuits as shown, the readings may be brought up scale by use of the wattmeter reversing switch. If the wattmeter does not have a reversing switch, the connections to the current-coil should be reversed, which will have the same effect. Connections to the potential coil should not be reversed as this introduces error in indication and also could result in damage to the meter.

If any wattmeter, connected originally as in Fig. 16 or 17, reads backwards and therefore requires the use of reversing switch or reversal of current leads in order to bring the reading up scale, then that reading should be treated as a negative quantity when adding the individual wattmeter readings algebraically to determine the true total power of the circuit.

What is the difference between a wattmeter and a watt-hour meter?

A wattmeter is an instrument for measuring power at a given instant and is usually calibrated to read watts or kilowatts. A watt-hour meter, Fig. 18, is an energy-measuring instrument which reacts to power consumed by a device or system and to the time such power flows. It is usually calibrated to read watt-hours or kilowatt hours.

The watt-hour meter is in effect a special motor, designed with internal magnetic braking which controls the speed of the armature so that such speed is proportional to the electric power being delivered. Over a given period of time the revolutions of the motor, totaled by a counter, represent the total energy delivered to the device or system.

What tests could be made to determine the load on a motor?

Perhaps the easiest test would be to measure the motor line current with an ammeter and compare this with the rated full load current as imprinted on the nameplate of the motor. If the motor line current exceeds the rated full load current and if the motor is continued in operation there is the very real possibility that the motor will overheat and fail.

Most motors are designed for and will carry a certain per cent overload. However, if the extent of this design or permitted overload is not known, it is wise to reduce the load at least until more can be learned of the motor.

Manufacturers of motors have load data available on their motors and it may be obtained upon request. A typical form for such data is a series or family of performance characteristic curves. These show the horsepower output of the motor for a range of watts input or line current from zero load to some degree of overload. With this data available, a series of readings

Fig. 15. Instantaneous values of power input to this single phase motor are readily plotted by observing wattmeter

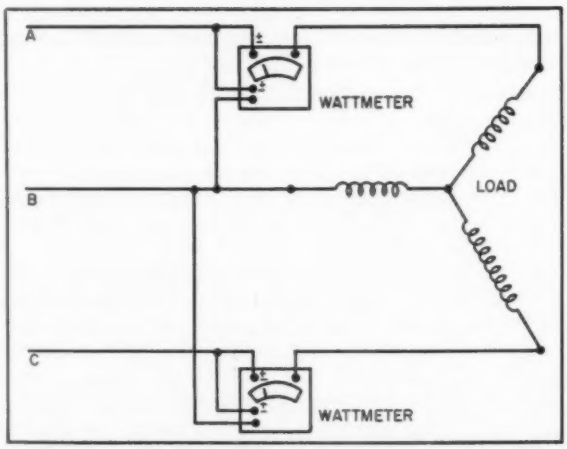


Fig. 16. Connections for measuring power in balanced three phase, three wire, circuits using two single phase wattmeters

of line current or wattage input will quickly determine motor load.

Can a thermal ampere demand meter be used to determine heating effects and true load on feeders and transformers?

Yes. A thermal ampere demand meter is activated by the heating effect of the current passing through the meter and indicates the average maximum current in any given period. It may then be reset for use in the following period. The time at which such current was drawn by the load or its duration is not indicated. However, the average maximum current on a feeder or transformer is thereby measured and indicated for evaluation of load distribution.

Can a thermal ampere demand meter be used to determine if additional motor and welder loads can be carried on a feeder which is apparently overloaded?

Yes. If such apparent overload is the result of totalling the rated full load current of all loads on the feeder in question, then a more careful study is recommended. Such study should take into consideration the operating load cycles of each device on the feeder and how the total ampere demand at any instant compares with the permissible maximum current on that feeder. This is most easily accomplished by the use of graphic thermal ampere demand meter.

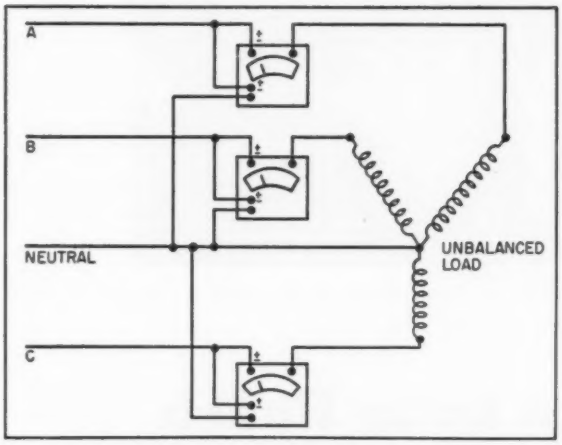


Fig. 17. Power measurements in three phase, four wire, unbalanced circuits require use of three single phase wattmeters

Fig. 18. Watthour meters record use of power during a definite period, are used to determine charges for power bills

How can demand be controlled and demand cost reduced?

Many bills for electric service include demand charges. Such charges may amount to a considerable per cent of the bill although such demand does no work. Often a survey of electrical energy use within a department, on a feeder or in the plant as a whole will reveal many opportunities to reduce demand. Operations can often be adjusted so that peak loads on various devices do not occur at the same time. Even a slight shift of individual maximum loads can result in a very worthwhile reduction in total demand.

Demand limiting meters are available which record maximum kilowatt demand which has occurred at any time within the period, time which has passed since the start of the period, and total demand in kilowatt-hours. The meter is also a control device connected to motors, heaters, and other loads in a given area. Such units are thereby energized or disconnected in a predetermined pattern so as to limit the demand.

What is an insulation resistance meter and how is it used to predict insulation failures?

These meters generally include necessary equipment to provide high voltage for test and instrumentation to indicate the value of any resulting leakage current. The high voltage is applied between coils of a motor, from coil to ground, across a condensor or any other application where effectiveness of insulation is in question.

If the flow of the leakage current through the insulation is greater than the accepted value for such material in such application, then action should be taken to improve the insulation. This is necessary to prevent ultimate breakdown of the insulation and passage of damaging currents.

What is an ohmmeter?

A typical ohmmeter is a portable low voltage, direct current device having its own battery as power source and calibrated to read resistance directly in ohms. Its scale range is zero to infinity and it can be calibrated for effective use in any part of such range.

How is an ohmmeter used?

The two external leads, usually fitted with probes, are used to contact two points in the circuit being tested. A reading of infinity would indicate that an open or very high resistance is present somewhere in the circuit. A zero reading would indicate a very solid, low resistance path. A reading of other than infinity or zero may be all that is necessary to indicate that a given coil, for example, is satisfactory.

Accumulation of moisture in motor coils usually requires baking to reduce such moisture. A series of readings with an ohmmeter will indicate progress of such baking and enable safe values of coil insulation resistance to be obtained. Ohmmeters are often used to check continuity of individual conductors in a cable made of many hundreds or thousands of small conductors, such as used in communication networks. **End**

Fig. 1. Mobile crane unloads and stores incoming material for transfer by an overhead crane

Roving Crane With a Long Reach

Versatile Unit Betters Plant's Material Handling Setup

EVEN THOUGH Superior Tube Company of Norristown, Pa., a leading manufacturer of small diameter tubing, has spread its materials storage all over the lot, it saves time, money and production space by doing so. Spread-out storage areas are linked to production areas by means of a self-propelled hydraulic crane equipped with a telescoping boom.

Under the old method, a truck crane owned by a local contractor was hired at $60.00 a day each time a shipment of "billets" came in. This equipment brought material within reach of the overhead crane. The job usually took a full day for one railroad gondola, about 40 man-hr to unload and store a complete shipment.

Now, billets are brought directly from the supplier's mill to the plant by trailer truck. The average truck trailer can be unloaded in 3 hr by the firm's mobile Austin-Western crane and two men. A shipment equivalent in size to an average rail shipment of billets can be unloaded and stored in just 15 man-hr, a saving in time of about 62 per cent.

The mobility of the hydraulic crane permits storing of incoming billets anywhere in the yard. When the material is needed for production, this equipment is on hand to move it into the range of the overhead crane.

No longer needed for unloading incoming supply trucks or for placing billets in the racks, the overhead crane takes billets from the racks and delivers them to production machines.

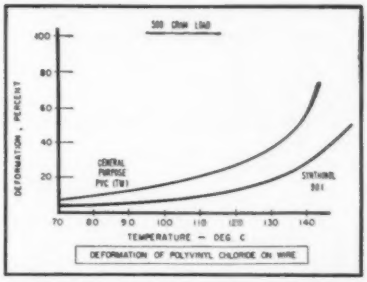
Handling of strip coils has also been affected by the introduction of the mobile crane. To avoid unnecessary work, coiled strip steel was stored inside the plant. While in-plant storage did save time and handling, use of valuable space prevented the installation of production machines in the 2000 sq ft area where the coils were stored. Moving the strip by hand was a tough, brutal job for a six-man crew and required about 5 or 6 hr per truck-

Troubled with wiring failures in your plant?

If so, consider the record being established by Rome Synthinol 901, a special 90° PVC compound for wire insulation and sheathing. It has helped to solve an impressive list of difficult wiring problems.

Developed by Rome Cable's laboratory and first introduced in 1949, Rome Synthinol 901 has proved by test and actual use to be superior to conventional PVC compounds in the following ways:

a. Suitable for continuous operation at higher temperature (90°C).
b. More stable under severe heat cycling.
c. Suitable for continuous immersion in hot transformer oil.
d. Superior resistance to chemicals and solvents.
e. Greater resistance to heat deformation.



Graph shows heat deformation vs. temperature, and compares Synthinol 901 with conventional PVC compounds. Test run in accordance with Underwriters' Laboratories standard procedure, except for temperature.

The practical value of this compound can best be illustrated by describing a number of actual case histories.

(1) Oil refinery, industrial and chemical plant wiring.

Plant and oil refinery engineers have long used conventional PVC insulations for plant wiring with good results, but too often heat deformation problems arose in warm locations. Since Rome Synthinol 901's superior deformation resistance suggested that it might be the answer to this problem, it was tried and soon became widely used because of its much better service record.

Synthinol 901 also proved to be far superior to conventional materials for chemical plant wiring where the corrosive action of chemicals and solvents has always been a tough problem. Although polyvinyl chlorides as a class have inherently better resistance to chemicals and solvents than many other materials, some engineers desired even further improvement. One user decided to test a number of samples over a long period by immersing them in various concentrations of acetone, different alkalis, and butyric, propionic, and acetic acids. The results of this careful evaluation showed clearly that, when exposed to these chemicals, Synthinol 901 would last longer than any other PVC tested.

(2) Oil-filled transformers.

Transformer engineers have long sought a cable construction to replace varnished cambric-insulated cable for leads in oil-filled transformers. These leads connect transformer windings and bushings and are constantly immersed in hot oil. One transformer manufacturer, encouraged by successful experience with Synthinol 901 on other applications, undertook a comprehensive study of the possible usefulness of this insulation in lieu of varnished cambric for high-voltage transformer leads. This study extended over a several-year period and proved to those engineers involved that there were at least four reasons for standardizing on Synthinol 901 for this application:

a. There was less sludge in the oil than when VC insulation was used.
b. There was no harmful degradation of the electrical properties of the oil.
c. Conductors insulated with Synthinol 901 ran cooler, permitting a 7% increase in lead cable current rating.
d. The use of Synthinol 901 in lieu of VC would permit substantial dollar savings.

(3) Coil leads.

Many manufacturers of small coils for relays, small transformers, small motors, and electronic components have tried to use PVC insulated lead wires for many years. Typically, these leads are crimped or soldered to the ends of the coil; and the whole coil is then impregnated with varnish or wax and baked as long as 16 hours at temperatures as high as 150°C. The varnish used may be asphaltic, phenolic, alkyd, etc.; and the wax may be paraffin, beeswax, carnauba, or another kind.

PVC insulated lead wires frequently produced serious production problems because of the insulation's tendency to shrink, crack, and stiffen during the impregnation and subsequent baking period. Synthinol 901 was substituted in place of the ordinary PVC insulation and, after nearly eight years of wide usage, not a single case of shrinkage, cracking, or stiffening of insulation involving Synthinol 901 has been brought to our attention.

These case histories describe just a few of the applications for which Rome's Synthinol 901 has proved especially effective. Perhaps they will suggest other applications in your own area which might also be better handled with Rome Synthinol 901 instead of a conventional PVC compound. If you have a wire or cable problem that might be solved with Rome Synthinol 901, why don't you get in touch with us? Contact your nearest Rome Cable representative for more information—or write to Department 322, Rome Cable Corporation, Rome, N. Y.

ROME CABLE
CORPORATION

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load. It now takes two men and the mobile crane about 1 hr per truck and the coils are stored outside. As coils are needed, the crane moves them. See Fig. 3. Total saving for this operation is 28 man-hr per truck load.

The crane's hydraulically operated telescoping boom has a maximum horizontal extension of 30 ft which permits the crane to reach into truck trailers, and locations with low overhead clearance.

Boom Rotation

Material to be stored or picked up from confined places can be reached readily by employing the crane's steering setup and the boom's turntable which rotates through a 270-deg arc. When the driver's cab is not installed, the boom can be rotated completely through a full circle in either direction. The crane's boom can be elevated to angle of 66 deg from the horizontal.

An International Harvester gasoline engine powers both crane and chassis. As a guide to engine service and preventive maintenance, a meter on the instrument panel keeps an accurate record of the number of hours the crane is operated.

A three-speed transmission, torque-converter and two-wheel drive complete the drive chain on the self-propelled chassis. Electric lights and directional signals permit the crane to be operated on public highways, a feature frequently used at Superior when the crane is driven to a subsidiary plant in Phoenixville, about six miles from the main Norristown plant. A fully enclosed cab, complete with heater and defroster, keeps the operator comfortable in all kinds of weather. See Fig. 2.

In addition to saving valuable man-hours in materials handling and freeing in-plant production space, the usage of its own mobile crane has permitted the firm to schedule manpower for truck unloadings — an arrangement difficult to carry out when dependence was placed on a truck-crane hired on a per-job basis.

Possession of the crane also permits Superior to release carriers' trucks in less than half the time previously required. In many instances, demurrage charges, which otherwise would have been incurred, have been avoided.

Fig. 2. Unit's suitable for road trips

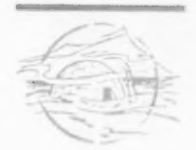
All kinds of odd jobs involving the lifting, carrying and placing of equipment and supplies are handled by the crane when it is not otherwise in use. Elmer C. Maul, shop foreman, says he is constantly finding new uses for the crane. He has used it for rigging, moving a flagpole, even for replacing tarpaulins on truck trailers.

Maul has found that the crane is so simple to operate that anyone familiar with vehicles can become a highly skilled operator after only a few hours of training. **End**

Fig. 3. Adjustable boom can be used to get coiled strip inside

Fig. 4. A trailer can be unloaded in any convenient location

NEW R&M Re-Rated Series 254U All-Weather Motors



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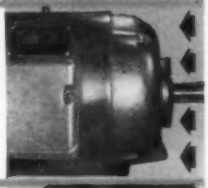
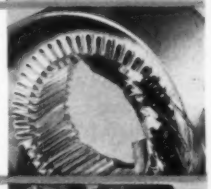
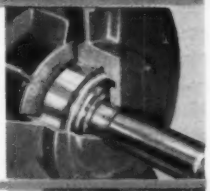
full height end head protection



Mylar insulation increases motor life*



bearings easily inspected by removing cover plate



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Mississippi River "Harbor" Boasts Tank Farm—Available for Lease

SOMETHING NEW in the storage and distribution field, a liquid storage and warehousing facility, is being put into operation by the Memphis Mixed Products Terminal Corp., Memphis, Tenn. According to the company, this is the first time that a tank farm operation has been made available to distributors, manufacturers and shippers on a lease basis.

The new operation is located on an 11-acre site on President's Island, in Memphis Harbor, and already has tanks for storing and dispensing petroleum jelly and liquid fertilizers. Since each different product requires different tank specifications, the tanks are being built as contracts for their use are negotiated.

Average tank size will be 600,000-gallon capacity, and will be built to store molasses, chemicals, heavy petroleum products, vegetable and animal oils, syrups and some types of acids.

Location of the terminal permits direct access to river barges—some of which range up to 4½ million gallons in capacity—rail and truck line services, so that the terminal can be used as an accumulation or distribution point, or both.

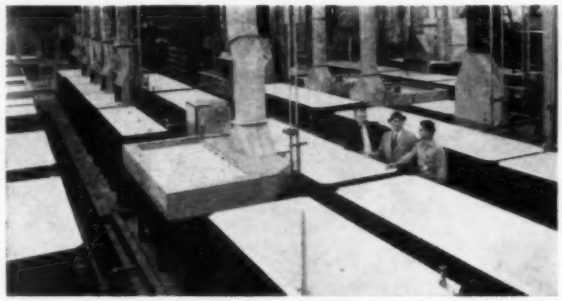
Rigid Plastic Sheeting Protects Tanks in Largest Aircraft Parts Plating Plant

PLASTIC "ARMOR" will protect the world's largest aircraft parts plating plant when it goes into production at McClellan Air Force Base, Sacramento, Calif.

Koroseal polyvinyl chloride material, manufactured by B. F. Goodrich Industrial Products Co., Marietta, Ohio, sheathes plant equipment against corrosive plating solutions and fumes.

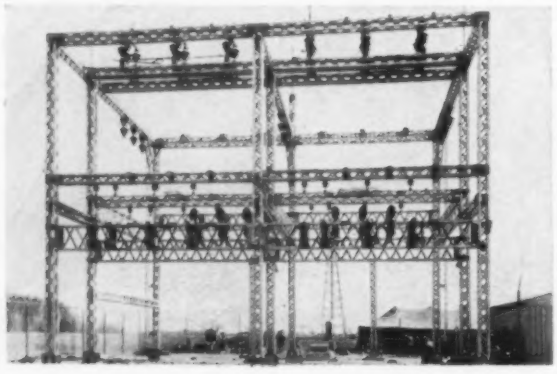
The new plant will plate and anodize engine parts, landing gear, tubing, electronic parts, communication equipment, fuel cells and wing tanks for jet aircraft.

New England Lead Burning Co., of San Leandro, Calif., lined and covered 135 tanks with flexible Koroseal tank lining sheet and fabricated necessary hoods and duct work from high impact rigid sheet. Tank interiors are lined with white plastic; exteriors are covered with black. All of the hoods and part of the duct work were made from one-quarter-inch high impact rigid sheet.



Prefabricated Aluminum Structures Speed Substation Erection

FIRST OF ITS KIND, a prefabricated, all-aluminum electrical substation was erected recently for Consumers Power Co. at Alma, Mich. Only six hours were required to raise and position the various building sections after they were assembled on the ground.



Light in weight, the prefabricated trusses and structural parts were handled easily by the construction crew. The design, known as Alrectic, was developed in aluminum by Handley-Brown Co., Jackson, Mich., with design and engineering assistance from Consumers Power and Kaiser Aluminum & Chemical Sales, Inc.

The system uses standard truss beams, fixtures and other parts. Trusses are one foot square, or one foot by two and a half feet, and are fabricated in lengths up to 60 ft. Of welded construction, they consist of four extruded aluminum chords supported by lacing. Sides and ends are precision punched with holes spaced at three-inch intervals.

Vertical columns and cross beams were assembled on the ground and bolted together with aluminum alloy fasteners. A truck-mounted crane was used to lift each arch upright and set it onto concrete piers where it was bolted securely. Horizontal trusses were placed between the arches forming a wing of the substation and this same procedure was followed until completion.

"How G-E carbon brush engineers helped...

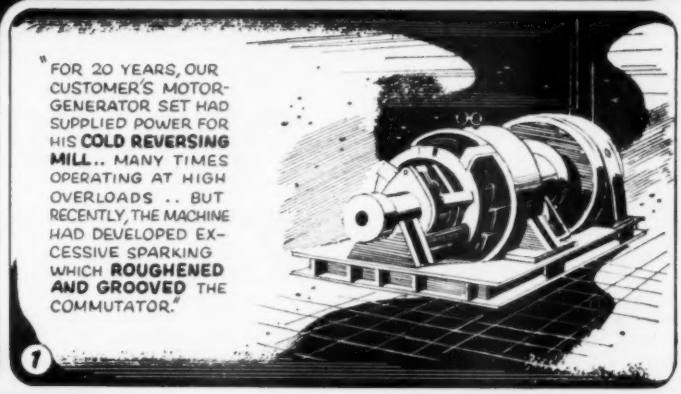
STOP POOR COMMUTATION"

A GENERAL ELECTRIC CARBON BRUSH CASE HISTORY

AS TOLD BY

Carl Ahlstrom

CARBON PRODUCTS APPLICATION ENGINEER GENERAL ELECTRIC COMPANY



1 "FOR 20 YEARS, OUR CUSTOMER'S MOTOR-GENERATOR SET HAD SUPPLIED POWER FOR HIS **COLD REVERSING MILL**.. MANY TIMES OPERATING AT HIGH OVERLOADS .. BUT RECENTLY, THE MACHINE HAD DEVELOPED EXCESSIVE SPARKING WHICH **ROUGHENED AND GROOVED** THE COMMUTATOR."

2 "IN SPITE OF MANY ATTEMPTS BY THE CUSTOMER TO IMPROVE THIS CONDITION, SEVERE **SPARKING** PERSISTED. THE ONLY IMMEDIATE ANSWER WAS **REPEATED GRINDING** OF THE COMMUTATOR.. A **COSTLY** AND **TIME-CONSUMING** JOB."

3 "FACED WITH **CONTINUING MAINTENANCE,** THE CUSTOMER MADE A **DECISION**". A GENERAL ELECTRIC CARBON PRODUCTS APPLICATION ENGINEER WAS CALLED, AND A THOROUGH ON-THE-JOB STUDY WAS RECOMENDED TO LOCATE THE PROBLEM.

4 "WE CONNECTED A RECORDING OSCILLOGRAPH AND BRUSH PROBES TO THE M-G SET TO MEASURE VOLTAGE DROP DURING TRANSIENT LOADS. IT WAS QUICKLY APPARENT THAT THE MACHINE **ADJUSTMENT WAS OFF.** BRUSHES WERE SHIFTED TO PROPER ELECTRICAL NEUTRAL, AND THE COMMUTATING FIELD STRENGTH WAS ADJUSTED.. A **G-E** BRUSH WITH **BETTER COMMUTATING** CHARACTERISTICS FOR THIS APPLICATION WAS SUBSTITUTED."

5 "**RESULTS?** NOW OUR CUSTOMER'S COMMUTATION PROBLEM IS CLEARED UP. SINCE THE CHANGE WAS MADE, HE'S ENJOYED GREATER OUTPUT, **LONGER BRUSH LIFE** AND **BETTER SERVICE CONTINUITY.**"

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NEW PLANT CONSTRUCTION — advance information on location, costs

Los Angeles, Calif.—Chun Wong Inc., processor of frozen Chinese foods, has broken ground for a new food processing plant here reported to cost in excess of $500,000. The concrete tilt-up type structure will have 35,000 sq ft of floor space on a plant site of more than four acres. Plant is slated for completion in 1958.

San Diego, Calif.—The Kin Tel Division of the Cohu Electronics Co., Inc., announces an expansion program which will increase present facilities here. Plans call for the erection of a new building estimated to cost approximately $250,000. It will house the newly established Kin Tel special products division, which will fabricate digital instrument systems for both military programs and private industry. Work will get under way at once for completion by early 1959.

East Hartford, Conn. — Fuller Brush Co., 3586 Main St., Hartford, Conn., plans to construct a new plant on large building site located here. Construction, reported to cost about $5.5 million, will get under way this summer, with completion scheduled for the fall of 1959. When completed, new plant will replace company's existing plant and office in the same city.

Lemont, Ill. — Ceco Steel Products Corp., 5601 W. 26th St., Chicago, Ill., plans to construct an $11-million bar steel mill here. The 141,230 sq ft plant is estimated to be in full operation by late 1960. New unit will be operated by a new wholly-owned subsidiary, Lemont Manufacturing Corp., and will produce steel for company use only.

Kansas City, Kan.—Sealright-Oswego Falls Corp., Fulton, N. Y., manufacturers of paper containers and milk bottle closures plans expansion of company facilities here. Plans call for an addition to present manufacturing facilities including a large warehouse unit. Expansion cost is reported to be in excess of $500,000. Work is already under way and is scheduled for completion by early 1959.

Owensboro, Ky. — Dewey and Almy Chemical Co., Division of W. R. Grace Co., 62 Whittemore Ave., Cambridge, Mass., plans to construct a new plant here. As part of a major expansion program, new facility will more than double campany's capacity for production of polyvinyl acetate copolymer emulsion. New plant, reported to cost about $4 million, is already under way and is scheduled to be completed by the spring of 1959.

Baltimore, Md. — Kennecott Copper Corp., 161 E. 42nd St., New York, N. Y., is constructing a new electrolytic copper refinery near here, and it will cost approximately $30 million instead of $20 million originally planned. Larger plant will have an initial capacity of 16,500 tons per month as compared with 7000 tons per month. Ground will be broken shortly for the new plant which is scheduled to be completed by late 1959.

Sudbury, Mass. — Raytheon Manufacturing Co., 90 Willow St., Waltham, Mass., plans to construct a large electronics laboratory on a 50-acre site. New facility which will be a one-story steel and concrete structure will have a floor area of 80,000 sq ft. Cost, with land and equipment, reported to be in excess of $1 million.

Cold Water, Mich. — American Metal Climax, Inc., is constructing a new plant for producing molybdenum metal and molybdenum-base alloys. New facility, reported to cost approximately $1 million, will be owned and operated by Climax Molybdenum Co., a wholly owned subsidiary. New plant, already under construction, will produce material used in guided missile components and is expected to be in operation by mid-1959.

Duluth, Minn.—Westinghouse Electric Supply Co., a wholly owned subsidiary of Westinghouse Electric Corp., Pittsburgh, Pa., plans to construct a large warehouse and office building. Work is now under way and building is scheduled for occupancy about January 1959. New facility will have a floor area of 16,000 sq ft. Project, including land and building, reported to cost about $250,000.

Springfield, Mo.—Royal McBee Corp., Port Chester, N. Y., plans to construct a new plant for the manufacture of portable typewriters. Construction of the 300,000 sq ft unit is expected to be completed in 1960. Estimate of plant's cost, with equipment, is expected to be in excess of $3 million.

Bound Brook, N. J. — American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y., plans to construct a multi-million dollar anthraquinone manufacturing plant here. New facility is included in company's over-all capital expenditures for plant modernization and expansion and will be operated by American Cyanamid's organic chemicals division.

Cranbury, N. J.—Unexcelled Chemical Corp., pyrotechnics, paints, etc., 350 Fifth Ave., New York, N. Y., has plans under way for development of an industrial park on a 435-acre tract of land, near company's present facilities. The site will serve as an over-all distributing, final assembly and packaging area, eliminating the need for multiple distribution centers. Cost of new facility is reported to represent an investment in excess of $1 million.

Lorain, O.—United States Steel Corp.'s National Tube Division plans to construct a new continuous buttweld pipe mill with capacity of 237,000 tons of finished pipe annually. Construction is scheduled to begin at once for completion by late 1960. Unit will be designed to produce finished pipe in a size range of 1¼ in. to 4 in. and will be housed in a new concrete structure.

Bridgeville, Pa.—American Cyanamid Co., Industrial Chemicals Division, 30 Rockefeller Plaza, New York 20, N. Y., plans to build a multi-million dollar plant on large site here for production of maleic anhydride, an organic chemical used in the manufacture of paints, varnishes and certain agricultural chemicals. Initial production capacity will be at a rate of 14,000,000 lb annually, with operations scheduled to begin late in 1959. Plant, when completed, will be incorporated into operations of the Plastics & Resins division.

Duquesne, Pa.—The Linde Company, a division of Union Carbide Corporation, 30 E. 42nd St., New York, N. Y., has announced the erection of a huge oxygen manufacturing plant and pipeline system to serve the U. S. Steel Corp. Plant will have a capacity of 1,000 tons a day. Facility, to be located here, will serve four U. S. Steel plants on the Monongahela River, south of Pittsburgh, Pa., and distribute oxygen to the other three plants by pipeline.

Philadelphia, Pa. — Chemetron Corporation's National Cylinder Gas Division will start construction soon on a $3-million liquid oxygen, nitrogen and argon plant, near here. Plant will have an initial capacity of 65 tons per day when placed in operation late in 1959. A direct pipeline is planned to the Alan Wood Steel Co., Conshohocken, Pa., which proposes to build a plant for the manufacture of powdered iron.

Magna, Utah — Kennecott Copper Corp.'s Utah Copper Division, 161 E. 42nd St., New York, N. Y., has authorized Rust Engineering Co., 577 Sixth Ave., Pittsburgh, Pa., to start construction on a major power plant addition at company's mining operations, located here. Cost reported to be about $16 million.

Parsons, W. Va.—Kingsford Chemical Co., Iron Mountain, Mich., plans to begin construction shortly on a new charcoal producing plant here. Company reported that the 20,000 sq ft plant to be completed late this year will make charcoal from hardwood and will represent an investment of approximately $500,000 when completed.

How Much Steam Should a Steam Trap Trap?

. . . some answers to commonly asked questions about the primary job of a steam trap

You don't need a doctor's degree in thermodynamics to answer the question at the top of this page. Naturally, a steam trap should trap *all* the steam.

Unfortunately for you, the problem isn't quite that simple. After all, a shut off valve would trap all the steam . . . and condensate, and air, and carbon dioxide as well.

So we'd better amend the answer to the question this way: A steam trap should trap *all* the steam but *must* remove condensate, air and carbon dioxide as rapidly as they accumulate.

With this established, let's take a closer look at what's involved:

A Steam Trap Should Trap All The Steam

If you've had experience with several different makes of traps, you already know that some trap steam better than others. The operating principle of the trap is what makes the difference. We like to talk about it because Armstrong traps are designed so that no steam can get to the orifice. The valve is always water sealed. Result: *More efficient steam utilization, lower fuel costs.*

A Steam Trap Should Remove Condensate

All traps remove condensate—after a fashion. For maximum efficiency in the unit being drained, though, the trick is to get it out without waiting for it to cool and without leaking steam.

Armstrong's water sealed valve takes care of steam leakage. The inverted bucket operating principle opens the trap for water regardless of its temperature. This means you get the condensate out as quickly as it accumulates. Result: *Higher temperatures and better heat transfer in steam heated units.*

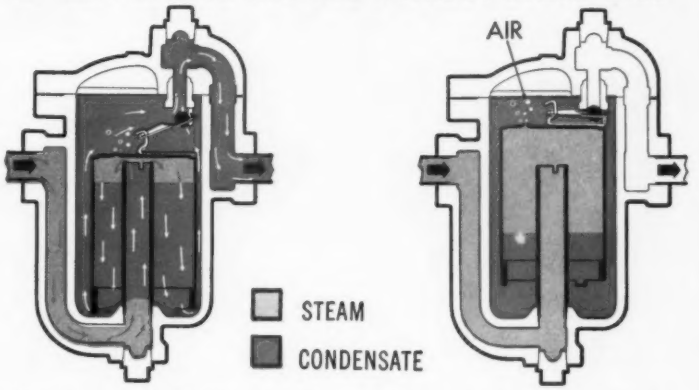
A Steam Trap Should Remove Air and CO_2

Part and parcel of the condensate removal problem is removal of air as well as oxygen and carbon dioxide—two real troublemakers. Air tends to reduce operating temperatures and interfere with heat transfer. CO_2 goes into solution to form corrosive carbonic acid which, for example, can eat unit heater tubes. O_2 aggravates the situation. Believe it or not, but all traps don't properly remove air and CO_2.

By now, you've probably guessed that Armstrong traps *do* remove air and CO_2. Armstrong design (see illustration) provides continuous venting of air and CO_2. By opening suddenly, the Armstrong trap creates a momentary pressure drop to "pump" the air down to be vented. Result: *Higher temperatures, faster heat-up, better heat transfer and reduced corrosion.*

Note: When required, specially sized air vents are furnished. For fast heat-up of low pressure on-and-off units, Armstrong provides open float and thermostatic air vent traps.

HERE'S THE STEAM TRAP DESIGN THAT GETS RID OF CONDENSATE AND AIR WITHOUT STEAM LOSS



Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate.

Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

What's the Final Answer?

Summing it all up, you'll get the best service from steam heated units that are equipped with traps designed to trap *all* the steam and remove air and condensate as quickly as it accumulates. In our prejudiced viewpoint, this means Armstrong traps. More important are the several thousand users of Armstrong traps who have proved the point.

Before you make up your mind, though, consider the minimum maintenance requirements of Armstrong traps . . . and the convenient assistance your local Armstrong Representative provides. These are important plus values.

Put Up or Shut Up

We're so confident that we "put up". Armstrong traps are unconditionally guaranteed to satisfy. So you can find out for yourself with practically no risk. If you're not completely satisfied with the way they do their job, you can get your money back.

* * *

The 44-page Armstrong Steam Trap book goes into greater detail on these and other Armstrong features. It also discusses trap selection, installation and maintenance. Ask your Armstrong Representative for a copy or write

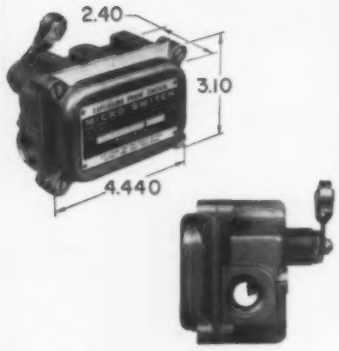
Armstrong Machine Works
9121 Maple Street
Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

For more facts circle 572 on Reply Card

MICRO SWITCH Precision Switches

Compact high capacity UL listed explosion-proof switches



There is a wide variety of explosion-proof switches in the MICRO SWITCH precision switch line to help you boost productivity of equipment

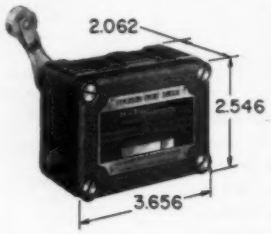
Here are a few examples of the many variations in mechanical and electrical characteristics, housings and actuators which are available in MICRO SWITCH explosion-proof switches. All feature rugged construction in sturdy housings, with a choice of mounting positions. Information on these precision switches is available from the MICRO SWITCH branch office nearest you.

Listed by Underwriters' Laboratories for use in hazardous atmospheres Class 1, Group C and D; Class 2, Groups E, F and G.

NEW

"EX1" SERIES

Series "EX1" switches have a conduit opening at both ends of the housing. This permits through wiring, which saves costs and space and improves appearance of the installation. Series "EX1" switches are available with four types of basic switches, with variations in electrical ratings, size of conduit openings and circuit arrangements. The switch illustrated has two ½-inch 14NPT conduit openings; capacity is 15 amps. 125, 250, 460 vac; ½ amp. 125 vdc; ¼ amp. 250 vdc. Contact arrangement is SPDT. Request Data Sheet No. 129.



"EX" SERIES, "AR" TYPE

Series "EX" switches have single conduit openings. They are available in a complete selection of actuators. There are 27 variations of the "AR" type alone, representing a wide choice of operating characteristics, electrical capacities and contact arrangements. This "EX" series switch is designed for cam or slide operation. Actuator is operated by clock-wise rotation, and it is adjustable through 360°. The roller is of non-sparking silicon bronze. Send for Catalog 83.

"ML-E1" SERIES

The "ML-E1" series of explosion-proof limit switches meets a wide range of requirements. For example, there are two-circuit double-throw double-break switches with a rating of 10 amps. 120, 240, 480 or 600 vac; 0.8 amp. 115 vdc; 0.4 amp. 230 vdc. The roller plunger actuator is for cam or slide operation. Sealed head can be rotated 90°. Wide choice of other actuators. Send for Catalog 83.

"ML-E1" SERIES

This series "ML-E1" switch has a roller lever actuator which can be positively locked at intervals of approximately 0.4° (870 positions). The actuator can also be adjusted to actuate the switch in the clockwise direction only, the counter-clockwise direction only, or in both directions. The head assembly can be faced in any of four directions and the roller arm may be reversed on the head. Send for Catalog 83.

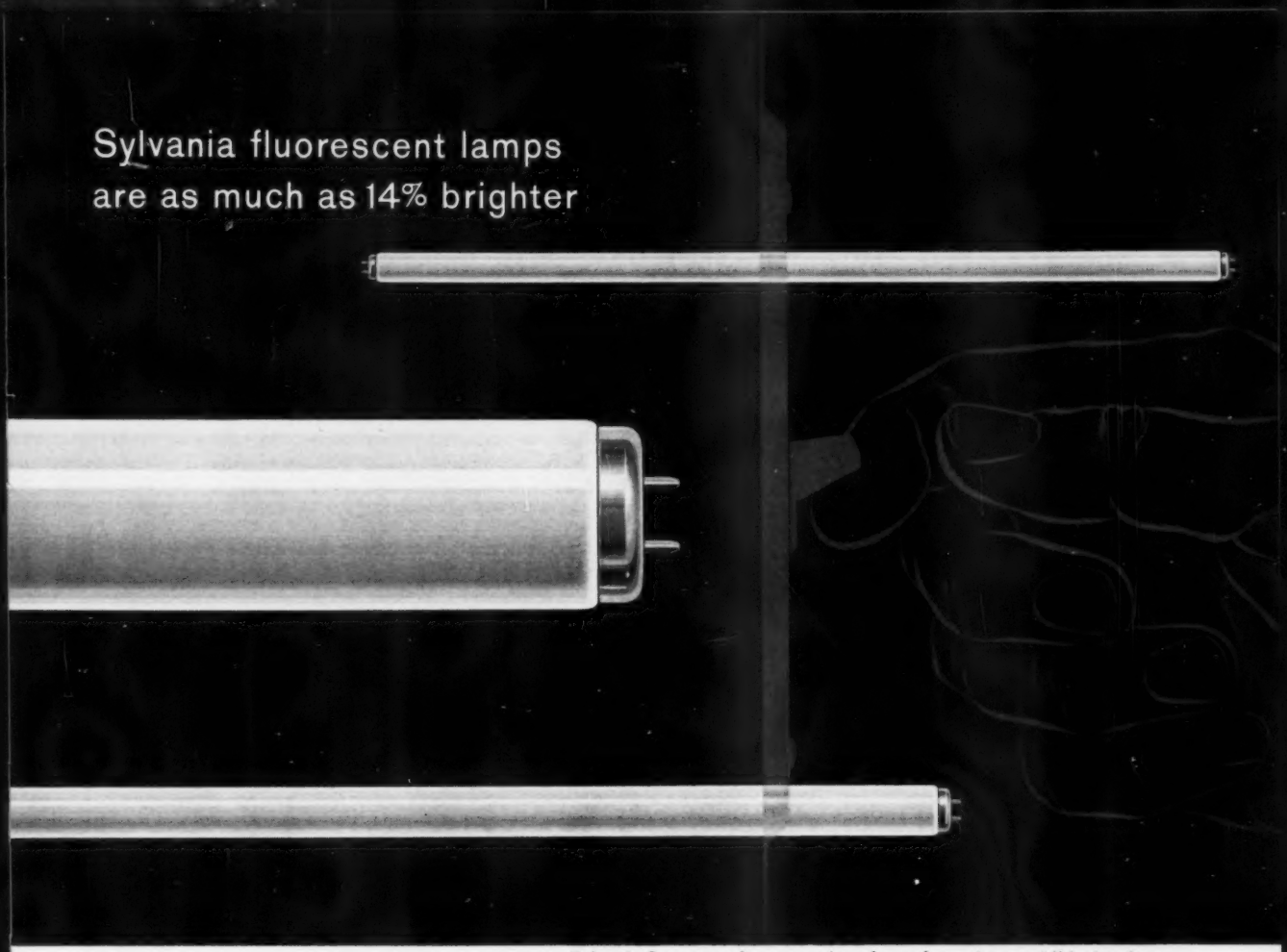
MICRO SWITCH . . . FREEPORT, ILL.
A division of Honeywell
In Canada: Honeywell Controls, Ltd., Toronto 17, Ontario

The two-word name MICRO SWITCH *is not a generic term. It is the name of a division of Honeywell.*

Look for the name of MICRO SWITCH *Authorized Distributors in the Yellow Pages*

Honeywell
MICRO SWITCH PRECISION SWITCHES

For more facts circle 602 on Reply Card



Sylvania fluorescent lamps consistently perform above published ratings from the start... deliver more light than other brands.

Another reason why

Sylvania Fluorescents give you more light at lower cost than all other brands

Advanced engineering makes Sylvania fluorescent lamps superior in many ways—makes light a better tool of production to increase profits

Tests in the laboratory and in working installations show that Sylvania fluorescent lamps consistently deliver more light.

During the past two years, alone, a comparison of Sylvania fluorescent lamp performance with the performance of other brands shows Sylvania lamps deliver as much as 14% more light.

This light output superiority means Sylvania gives you the maximum new-lamp performance you expect . . . gives you all the light you pay for . . . from the start.

Sylvania fluorescent lamps continue to give you this dividend of light throughout every burning hour . . . and deliver more light than other brands throughout their useful life.

This is another example of how Sylvania builds extra value into fluorescent lamps to help cut your lighting and operating costs.

Let your local Sylvania Representative show you how Sylvania's superiority can save you time and money. Call him today, or write:

SYLVANIA LIGHTING PRODUCTS
Division of SYLVANIA ELECTRIC PRODUCTS INC.
60 Boston St., Dept. 8L-7007, Salem, Mass.
In Canada: Sylvania Electric (Canada), Ltd.
Shell Tower Building, Montreal

SYLVANIA Lighting Products

make light a better tool for profits

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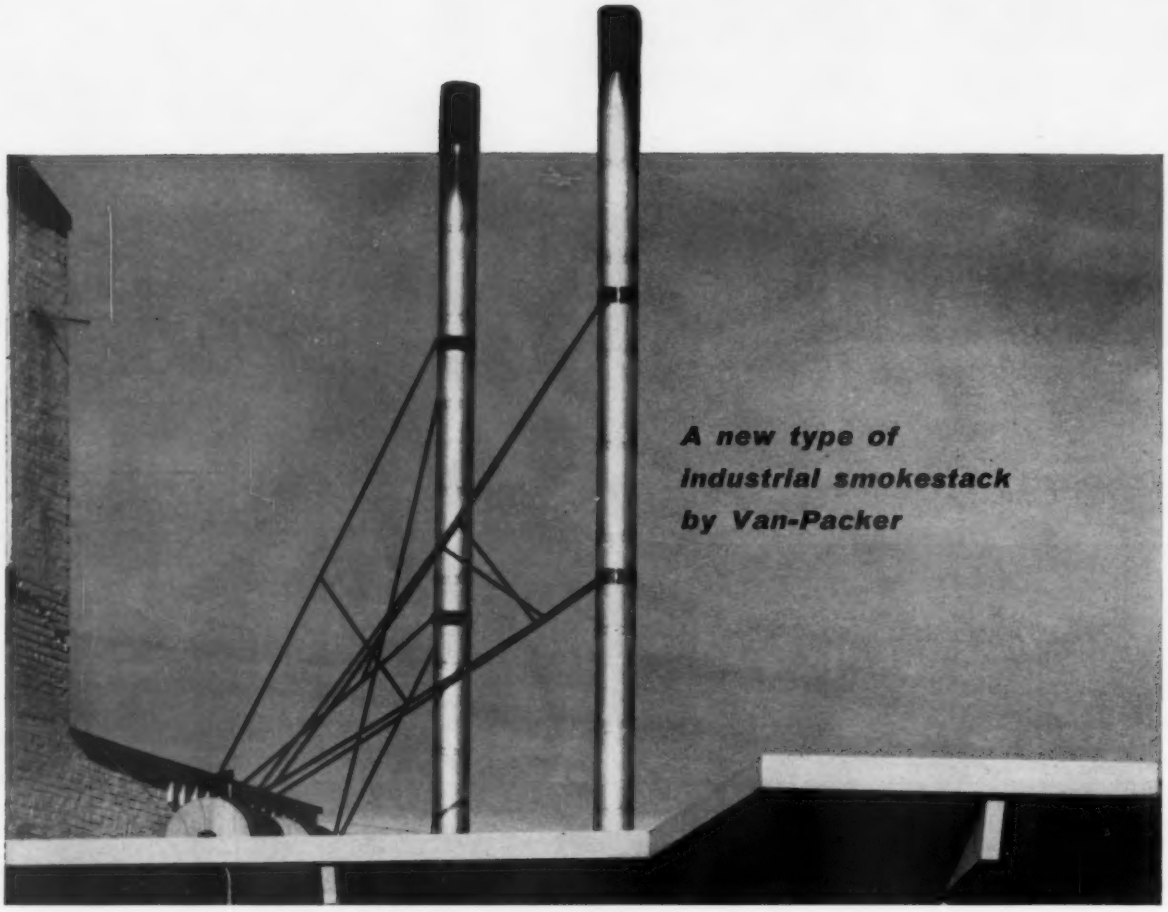


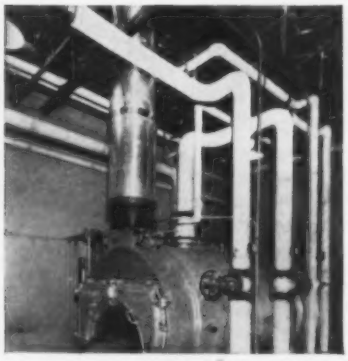
Get longer stack life at lower cost

Permanent construction — Because the Van-Packer is made of non-corroding refractory material it will outlast a steel stack as much as three times. The aluminum jacket which encases each stack section eliminates maintenance.

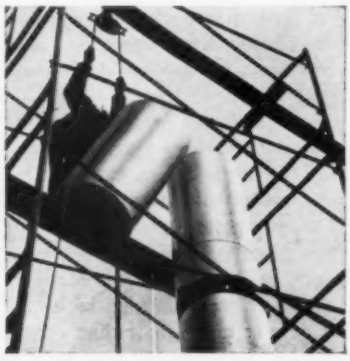
Low Cost — The Van-Packer costs no more than a steel stack, and only 1/3 as much as brick. Other savings result from fast installation, savings on maintenance, and long life. Handles all fuels for boilers, furnaces, incinerators.

Prefabricated refractory sections—Centrifugally-cast 3-foot sections combine the economy of a steel stack with the permanence and high draft of a brick stack. Seven diameters from 10-inch ID to 30-inch ID.

Available nationwide — Van-Packer Stack is available through local Van-Packer Jobbers and Special Representatives. See "Chimneys — Prefabricated" in Yellow Pages, or write Van-Packer for Bulletin IS-58.



Van-Packer Stack with Standard Sections handles boilers and furnaces efficiently. Can be superimposed or floor supported.



Installing this stack is quick and easy. Three-foot sections are simply cemented atop one another with acid-proof cement.

Van-Packer Hi-Temp Stack handles incinerators with flue gas temperatures up to 2000° F. without corroding.

Van-Packer PREFABRICATED REFRACTORY **Stack**

Van-Packer Company • Division of the Flintkote Company
P. O. Box No. 306, Bettendorf, Iowa • Phone East Moline, Ill. 3-5288

Sweet's

For more facts circle 574 on Reply Card

For more facts circle 575 on Reply Card →

your Aloyco sales engineer has only one business...

stainless steel valves

Your Aloyco sales engineer is a specialist... he handles only one line. You, as an Aloyco customer, deal directly with a man who knows his product and its application. He is equipped to get close to your problems and you'll find that this closeness to our customers goes right back to the Aloyco Plants. Doesn't it make sense to depend on the man and the company that specialize in corrosion resistant valves exclusively?

ALOYCO 503 Globe Valve... retained bonnet gasket... bolted bonnet... OS&Y... renewable Teflon disc fully retained. The Aloyco Valve line includes a wide range of alloys, types, sizes, and pressures of 150 lb, 300 lb, 600 lb and above. Nuclear Valves up to 2,500 lb.

ALLOY STEEL PRODUCTS COMPANY
Linden, New Jersey

Longer Lasting
ALOYCO
VALVES
1ST IN CORROSIVE SERVICE

ARCHITECTS and ENGINEERS: Skidmore, Owings & Merrill
GENERAL CONTRACTORS: Chell and Anderson
HEATING and PROCESS PIPING: Wm. A. Pope Co.
AIR CONDITIONING and VENTILATION: Cicero Sheet Metal Co.

Efficient Manufacture Employee Well-being

both aided by Clarage "air" in new Avon cosmetics plant

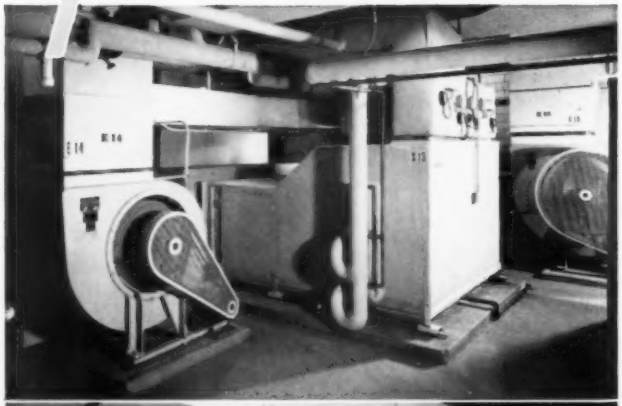
Here is much more than a thoroughly modern manufacturing facility. Here is a national sales center as well.

It's the new Avon Products, Inc., plant at Morton Grove, Illinois. From it flow the widely popular Avon cosmetic products. To it come members of Avon's door-to-door sales organization for training and sales meetings.

Air conditioning, thus, has a dual role to play in this structure – for employee comfort and for efficient manufacturing processes.

As for so many other noteworthy buildings, Clarage equipment was selected – some of which is shown on the right. On the job are Clarage Ready Unit ventilating sets, system fans, and Multitherm air conditioning units, including the famous Blow-Thru units pioneered and perfected by Clarage for multi-zone service.

You, too, will find it profitable to specify Clarage for your next assignments – no matter how large, how small. CLARAGE FAN COMPANY, Kalamazoo, Michigan.



CLARAGE ... *dependable equipment for making air your servant*

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal
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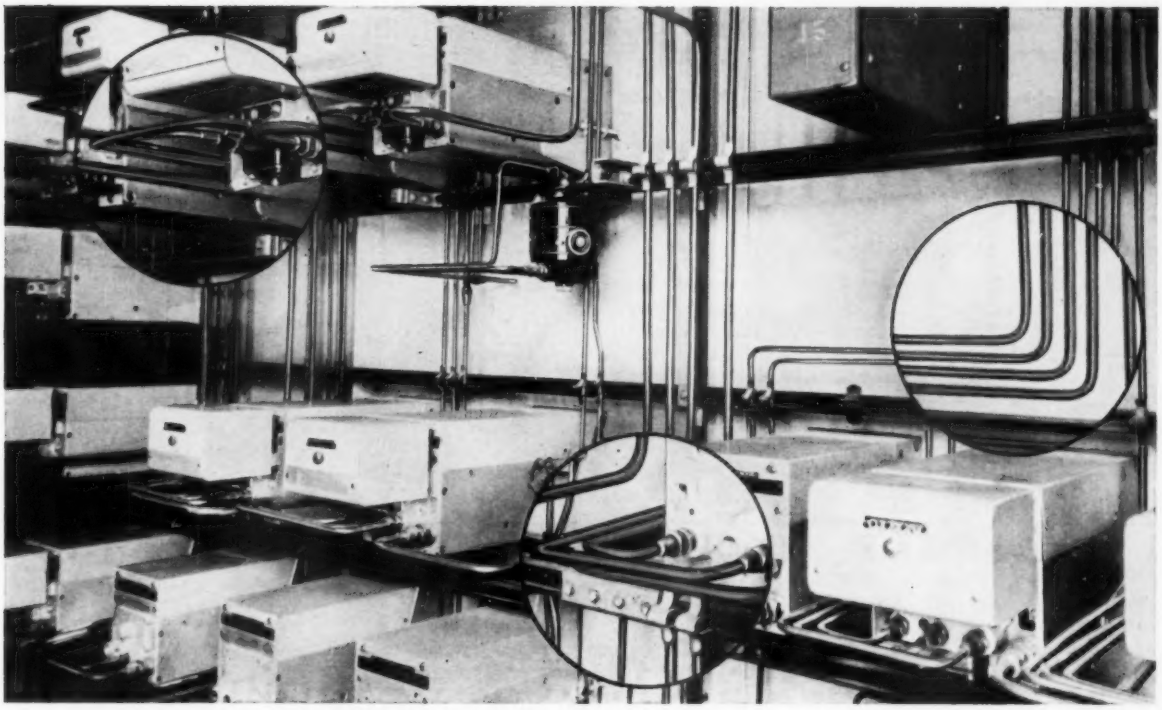
SAFETY m.i.
INDUSTRIAL WIRING CABLE

EASIEST TO INSTALL:

Safety m.i. Cable needs no raceway or other protection... trains easily anywhere, even around irregular contours... small diameter ...light weight.

TOUGHEST EVER MADE:

Safety m.i. Cable is tough, rugged, and practically indestructible . . . can be operated continuously at high temperatures... will not burn... resists aging, water, steam, chemicals, oils, and greases.



THROUGHOUT INDUSTRY General Cable's Safety m.i. Cable is in use in distribution, control and lighting circuits up to 600 volts. Leading industries include oil, chemical, steel, automotive, paper, glass, utilities, and railroads. In general applications Safety m.i. offers easy installation, neat appearance, easy training around obstacles, complete dependability for a long life with no maintenance. In special applications, "m.i." offers the additional advantages of a fully-insulated, self-contained wiring system which eliminates vapor passage. For truly modern industrial wiring specify "Safety m.i. Cable."

Available in 1, 2, 3, 4, and 7 conductor for power and control circuits.

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y.
Offices and Distributing Centers Coast-to-Coast

for quality and service... **specify** GENERAL CABLE

For more facts circle 577 on Reply Card

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 169-170.

1—FLOODLIGHT LAMP withstands severe vibration

The PAR-38, a floodlight lamp, involves a new concept of mounting the filament on tungsten springs, according to company, which makes it superior for any application where vibration is a problem. This would include use on portable and movable equipment, and on poles where wind vibration is a problem. The 150-w lamp is made for 120-v operation and has a medium skirted base. This lamp is designed to burn in any position. Westinghouse Electric Corp.

2—"TOUCH-UP" LACQUER for control panel-boards

This spray-on touch-up lacquer is designed for preserving the appearance of control panel-boards and to reduce time spent in touching up panel-boards. The lacquer comes in both ASA 61 gray and No. 7 light green. Packaged in a 16-oz aerosol container, application is fast and simple. Cost is under $5 per can. Panellit, Inc.

4—TREATMENT controls pH in recirculating systems

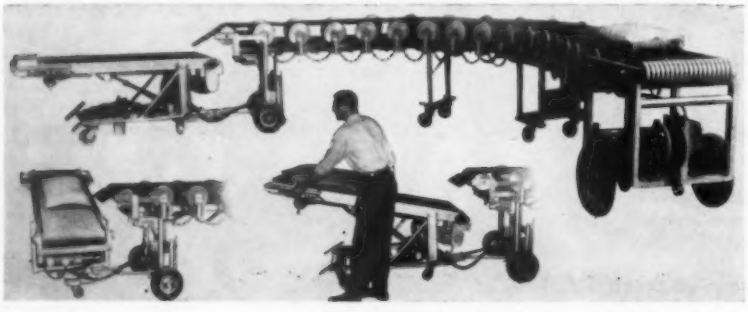
Buildup of slime, algae, corrosion and scale in air conditioning, humidifying and heat exchange equipment may be prevented with Airefiner 54, according to manufacturer. Used at concentrations of 2 to 4 lb per 1000 gal of water, Airefiner 54 is said to keep the pH of water in the low alkaline range, minimize delignification of wooden cooling towers and deposits of white coatings on equipment. Soluble in hot or cold water, the material is claimed not toxic in recommended solution and unaffected by heat. Oakite Products, Inc.

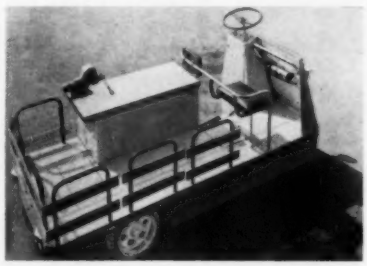
5—PNEUMATIC RELAY computes and compensates

This pneumatic relay is designed to solve equations continuously by combining two or more pneumatic signals in varying, predetermined proportions. The relay multiplies or divides one pneumatic signal representing a measured variable by some predetermined function of a second variable. Standard unit also adds and subtracts pneumatic signals and provides proportional control action. In process plants, it is suggested for ratioing of two flows in multi-element control systems, and for pressure-temperature compensation of liquid or gas flow measurement. Relay uses standard SAMA ranges of 3-15 psig and 3-27 psig. Bailey Meter Co.

3—SWIVEL STACKER facilitates loading bags into box cars

For use with company's standard Power-Curves, box car and truck loaders, this high speed stacker enables push-button car loading of bags, it is announced. You simply guide the bags as the conveyor stacks to full height anywhere in the car. The stacker is claimed capable of continuous operation at 30 bags per minute with one operator. Stacker and conveyor are push-button controlled from the same station, advance or retreat under shuttle power without interruption of flow. The loader carries bags through box car door and into the end of the car, or around corners, through aisles and doorways. Stacker unit can be disconnected from flexible conveyor. Stacker hoist is push-button hydraulic, lifts end of belt from 18 to 72 in. above floor. The stacker uses a rough-top belting. Power-Curve Conveyor Co.



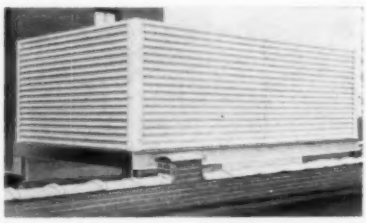


6—TRUCK has built-in maintenance facilities

Model 71 Maintenance Truck is an electric-powered, three-wheel truck designed to carry loads up to a ton and speed a maintenance crew along narrow aisles to plant trouble spots. Described as extremely maneuverable, the truck features four industrial batteries and built-in automatic charger, large work bench with vise, built-in tool box and large load area protected by steel and aluminum stakes, in addition to room for a stand-up driver and sit-down rider. The truck is equipped with company's Dyna-Power gear motor providing direct-in-line two-wheel drive. It is built to be driver-serviced from "topside." Electri-Car Div., Victor Adding Machine Co.

7—COOLING TOWERS are completely enclosed

Underflow Aquatowers expose no louvers, no fan, no piping. As their name indicates, these intermediate capacity, low silhouette towers combines in their functional principle several accepted designs: crossflow, forced draft and company's Double-Flow. They are suggested for air conditioning applications where appearance, quiet operation and operating economy are factors. A heavy duty fan at the bottom of the Underflow blows air upward into a plenum chamber where it is diverted through the filling in dual cooling areas, and is then discharged vertically through air outlet at each end of the top of the towers.



Location of mechanical equipment

Cities Service shows how to cut valve costs

Crane globe valve in 14th year on steam turbine line

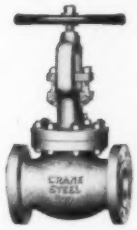
Cities Service Refining Corp. uses hundreds of valves at its Lake Charles, La., plant. Maintenance and replacement costs could be staggering, but for careful control of valve selection.

For example, the Crane 6-inch, 300-pound steel globe valve shown above was installed at the Lake Charles plant 14 years ago. Working at 250 psi., 600 deg. F., the valve is used in the steam line to a turbine-driven feed-water pump.

In spite of its operation 3 or 4 times a week, this sturdy Crane valve has continued tight in service and has required no repairs in 14 years!

Thrifty buyers want no better reward than the kind of cost-cutting, dependable service they get when Crane valves are installed.

That's why in the petroleum industry, as in all industries, you'll find more Crane valves used than any other make.



This is the valve used on installation above. CRANE 151XR, 300-pound cast steel globe valve for 850° F. maximum temp. Sizes: 2 in. to 8 in. For full details, see your Crane Representative, or write to address below.

CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

For more facts circle 578 on Reply Card

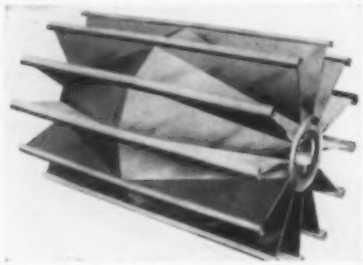
NEW PRODUCTS

(Begins on page 138)

below the cold water basin level affords economy in piping and wiring, manufacturer says, and eliminates ladder-climbing from routine maintenance. Another feature cited is the integral cold water basin and tower supporting structure. No grillage is required, it is pointed out, merely four supporting piers which may be located to coincide with existing structural columns. This tower is also claimed to reduce fire hazard since the only exterior parts not encased with asbestos cement board are the limited drift eliminator areas behind end-wall casing. Details are in Bulletin UA-58. The Marley Co.

8—WING-TYPE PULLEYS with Taper-Lock hubs

Welded steel wing type self-cleaning pulleys have Taper-Lock hubs. Self-cleaning pulleys assist in belt align-



ment by preventing build-up of material on the pulley face. Hubs are designed to offer equivalent of shrunk-on fit on the shafting while permitting easy assembly and dis-assembly. Industrial Div., Continental Gin Co.

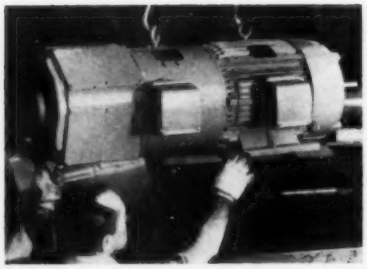
9—RECESSED FIXTURES are for high level lighting

The Argus series of recessed troffer luminaires is designed to produce custom high level lighting at low cost. They use high output and very high output lamps. They produce long continuous lines of unbroken light—integrated with ceiling construction. Manufacturer says they are ideal for 200 ft-c level lighting in large office areas, drafting or engineering rooms, laboratories. The long parallel strips of light create an interesting architectural effect. Cost-per-lumen is reported very low, particularly when using high output 800 milliamp units, and even lower when using VHO and PG lamps operating at 1500 milliamps. The Argus may be ordered in widths up to 12 in. (8 in. is standard); and in units up to four lamps (slimline only). Standard lengths are 4-, 6- and 8-ft. Lighting Dynamics.

10—PACKAGED DRIVE is integrated V-S unit

In the Rectiflow Drive, an a-c motor, a d-c motor, and semiconductor rectifiers are integrated. These drives are announced as affording continuously variable speed control over speed ranges of 1½ to 1, 2 to 1, or 3 to 1; maximum speed is 1690 rpm. Power requirements are supplied from normal a-c distribution systems. Now available in ratings of 7½ to 125 hp or higher, they can be designed to serve either constant-torque or constant-horsepower applications. Manufacturer says the drives have been applied to precision wheel grinders, aircraft test stands and textile machines. Other foreseen applications include machine tools, variable speed pumps.

Pictured is a 15-hp model. Basically, the drive consists of a wound-rotor motor (shown at right) and a d-c motor (center) built on a common output shaft. At left grouped behind covers are step rings, commutator and brushes. Semiconductor rectifiers rectify slip power from wound rotor to supply direct current to the d-c motor



armature. A second set of rectifiers serves to convert a-c line voltage to d-c to energize the shunt field of the d-c motor. Speed control is most simply obtained by varying a rheostat setting in this shunt field circuit, but the system permits inclusion of electronic and magnetic amplifier equipment.

In performance these drives are said to demonstrate speed regulation of 7.5 per cent over full speed range. Full load efficiency over entire speed range is given as 85 per cent for 125-hp units and not less than 80 per cent for lower rated units. Rectiflow Drives are somewhat longer than comparable d-c motors, and are smaller in diameter. Westinghouse Electric Corp.

11—ALARM make use of radioactive isotopes safer

The Gammalarm is designed to respond directly to radiation as low as 3 MR (1/100 of safe permitted dose); when it detects a presence of radiation exceeding a safe level, it warns by flashing lights, ringing bells and locking doors to working areas. You can preset the safe level of radiation according to your needs. When normal

radiation conditions prevail, the Gammalarm beams a green pilot light, it is explained, and the moment radiation exceeds the safe level this device flashes a red warning light. If more extensive warning is desired, loud speakers, bells, horns, sirens or other audible device can be plugged into the Gammalarm, manufacturer notes, and it will also lock doors to work areas by simple plug-in device. The unit is lunch-box size, weighs only 12 lb. It can be plugged into a 115-v a-c outlet. Power failure is indicated when both lights go out. Picker X-Ray Corp.

12—MOISTURE EXTRACTOR protects air tools, paint

DryAir 400 is designed to give clean, dry air for protection of all types of intermittently operated, air-powered equipment. This low priced unit has a rugged and simple construction without screws or bolts, says company, and automatically separates and removes oil, water and other foreign matter from the air line. It is available to fit a variety of line sizes ranging from ¼ in. with an 18 cfm maximum to ¾ in., 120 cfm maximum. Besides offering protection for air-powered tools, the unit gives clean, dry air for paint jobs. Spee-Flo Co.

13—VAPOR COLLECTOR uses water as medium

Type M Cycoil, an acid mist and vapor collector, uses water, rather than oil, as the collecting medium. It achieves a higher collection efficiency than conventional wet dust and fume collections, says manufacturer, yet is lighter, less bulky and lower in cost. It is designed to eliminate acid or alkali mist from plating, other processes.

This collector may be operated as an exhaust or blow-through cleaner, with contaminated air or exhaust gas flowing upward through a perforated plate into the eliminator section. This consists of a fluid-bed, polyethylene pad into which water is introduced in counter flow to the air. Moving air causes a liquid level to be established

Rx prescription for paper mill maintenance — GIVE STRUCTURE PROBLEMS TO I-P

Concrete structure of dam's tainter gate section was badly damaged by freeze-thaw action.

Tailrace piers below powerhouse illustrate excessive deterioration at water line in addition to weather damage.

Photos courtesy of Marathon Division of American Can Company

Marathon dam and powerhouse facilities at Rothschild, Wisconsin were restored to good-as-new condition by I-P maintenance services. Deteriorated masonry was replaced with tight-bonding, weather resistant Prepakt concrete. Even submerged damage was no problem because Prepakt is placed under water as easily as in the dry, with no loss of quality.

The ravages of weather, water and time prompted the Marathon Division of American Can Company to undertake a long range program to put its Rothschild, Wisconsin properties into first class condition. Like many other organizations, Marathon discovered that the next best thing to having maintenance-free structures was to place such problems in the hands of Intrusion-Prepakt—specialists for a quarter century in masonry rehabilitation and foundation stabilization.

It was necessary that production interruptions be avoided while repairs were under way. This precluded vacating work areas or dewatering around hydraulic structures. These were normal job conditions for the veteran crews and flexible methods of Intrusion-Prepakt. Tailrace piers, spillway and sluice gate structures were efficiently restored to good-as-new condition. Log and rock boom piers were rebuilt to exceed original strength and durability.

Exposed logs make boom piers susceptible to rapid deterioration (right). Prepakt consolidates and encases pier to form concrete monolith.

Let an I-P representative explain how economically *you* can forget structure maintenance problems and perk up your plant with Prepakt. For information, contact Intrusion-Prepakt, Inc., 568-P Union Commerce Bldg., Cleveland 14, Ohio. In Canada, 159 Bay Street, Toronto, Ontario. European Division, Zurbaran 14, Madrid, Spain.

INTRUSION-PREPAKT, INC.

OFFICES IN PRINCIPAL U. S. AND FOREIGN CITIES

•Intrusion and Prepakt are trade marks of Intrusion-Prepakt, Inc., whose methods and materials are covered by U. S. Patents Nos. 2313110, 2655004, 2434302 and others, also patents pending.

For more facts circle 579 on Reply Card

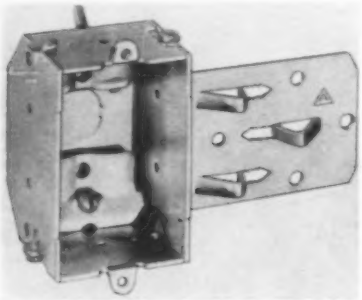
NEW PRODUCTS

(Begins on page 138)

in the polyethylene media and provides flooded contact surfaces for scrubbing. Excess water is forced to the sides and down to a drain pan. Normal water drain rate is given at 3 qt per hour for each 1000 cfm. A secondary pad removes any mist that may have escaped entrapment. Two basic designs are available, one with nominal 2-in. pressure loss with low humidifying efficiency, and one requiring a 4-in., pressure drop to provide higher collection efficiency at nearly saturated exit condition. Details are in Bulletin 286. American Air Filter Co., Inc.

14—SWITCH BOXES with easy installation feature

Anchoring prongs are an integral part of the Eagle Claw line of switch boxes and outlet boxes. These prongs are hammered into the studding like nails,



but do not need to be held. As the prongs enter the wood, they drive in and away from each other. Due to a compensating angle of the bracket, the box always rests at a 90-deg angle to the studding, it is pointed out. Holes are also provided in the side plate for use in special situations. These boxes are announced as UL approved. Easy installation, even in awkward situations, and firmness of the box, once installed, are among advantages reported. Appleton Electric Co.

15—CHEMICAL restores softener exchange capacity

Kleen-Ion is a dry powder blend of chemicals formulated to assist in restoration of exchange capacity of cation softeners operating on the sodium cycle. By its action, precipitated inorganic materials, biological growths, mud and silt are dispersed or solubilized to permit removal by backwash, it is explained, and similar benefits are obtained when Kleen-Ion is used to treat siliceous or anthracite filter beds. Betz Laboratories, Inc.

16—FLEXIBLE COUPLINGS are easy to install and align

These heavy duty flexible couplings come in sizes to 4250 hp and over. Connection to driving and driven shafts can be made in minutes, it is announced, and alignment is so simple it can be accomplished with a straight edge. With bore sizes ranging to 9½ in., the couplings have bodies and jaws of machined electric steel or nodular cast iron. The load is entirely transmitted through compression of individual load cushions. This eliminates wear on the metal jaws, says manufacturer, and also permits reversal or advancing of cushions on non-reversing loads to double cushion life. Once on, couplings are said to need no lubrication, practically no maintenance. Cushions can be removed without disturbing driving or driven units. Lovejoy Flexible Coupling Co.

17—SEALER for preventing dust and water leaks

Cushion Lock Sealing Compound is announced as a leakproof agent designed to prevent and eliminate water and dust leaks between members subject to movement, such as expansion or contraction due to temperature changes, flexing in the wind, buildings settling etc. Although it will do anything a calk will do, it is not a calk, manufacturer states; it is non-drying and non-hardening to provide a permanent seal that remains soft and pliable, retaining its adhesion, from —50 to 180 F. Shrinkage is given as less than 4 per cent, and the compound is reported to stick tenaciously to all types of surfaces, even wet, and to withstand constant flexing, expansion and contraction. A dry cloth removes excess application. Exposure to air develops a thin, tough hide which serves to prevent accumulation of dust and dirt in the air and to provide a base to paint over. Morrison & Co.

Use the Reader Service Cards provided on pages 169-170 to ask for more information on these products. Circle item numbers of products in which you are interested.

18—TIMER offers a broad range of settings

This synchronous motor-driven timer, Bulletin 10336, is available with 1-, 3- and 5-min timing units. The first is adjustable in 1-sec increments, 0 to 60 sec; the 3-min unit, in 3-sec increments, 0 to 180 sec; the 5-min unit, in 5-sec increments, 0 to 300 sec. Ease

with which these settings can be made is a feature. A bronze pointer is depressed and rotated to desired position on indicating dial and the timer is set. A terminal board and mounting base combination provides complete interchange of the dimensionally identical timing units. Quick-make and quick-break contacts in the timer's housing, mate with terminal strips on the mounting base to eliminate interwiring. The synchronous (clock type) motor operates on 110 v, 60 cycles. For 220, 440 or 550 v, 60 cycle service a control transformer and terminal block is added. Publication EN-33 gives details. Cutler-Hammer Inc.

19—STORAGE RACKS quickly erected

Consisting of two basic elements—pre-assembled structural steel end frames and horizontal runners—Fas-Lok Racks can be erected in a fraction of the time required for assembling many racks, manufacturer states, and no fasteners are required. These racks can be assembled into many combinations of height, length and shelf openings. Braced end frames, in standard heights from 5 ft to 22½ ft, have slots punched in the uprights on 3-in. centers. Horizontal runners have hookplates at each end. Each hookplate has two tapered ears which are inserted in the slots of the upright. You simply set the ears into the wedge-shaped slots and push or tap the horizontal runner down.

Horizontal runners come in lengths to 20 ft; end frames in depths from 2 to 5 ft, with capac-

Weldynamics*

*** ARC WELDING AT WORK CUTTING COSTS**

HOW YOUR NEXT JOB WILL BE HANDLED FOR LESS COST

For lowest cost, Weldynamics indicates that both AC & DC welding currents are needed to take full advantage of today's high-speed electrodes. One machine, Idealarc, fills this need . . . does the work of two welders. As a result, you need fewer machines, work scheduling is simplified, there are fewer machines standing idle.

Lincoln men, trained in Weldynamics, will show you how to apply these cost cutting advantages to your specific jobs—with the latest methods and electrodes available today.

Idealarc 180, 250, 300, 400 and 500 amp sizes. Available as AC or AC/DC welder. Can be purchased with AC only, adding DC later. Operates on single phase power. Write for Bulletins SB-1364 and SB-1343.

The World's Largest Manufacturer of Arc Welding Equipment

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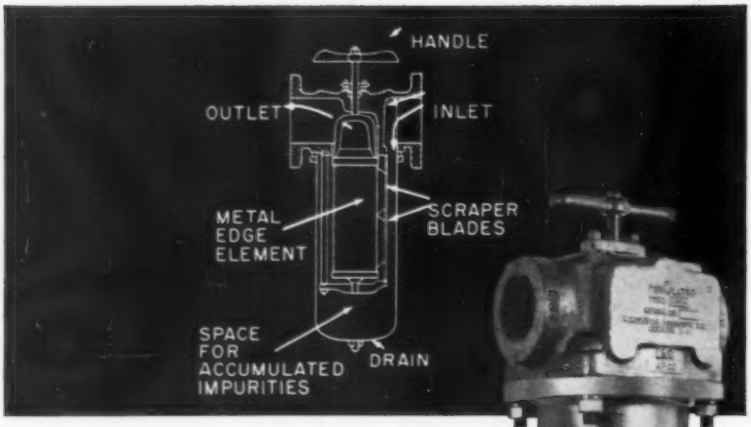
THE LINCOLN ELECTRIC COMPANY, DEPT. 4003, CLEVELAND 17, OHIO

For more facts circle 580 on Reply Card



This one standard Purolator filter is

EXACTLY RIGHT for all these fluids:

- inks
- paints
- varnishes
- food products
- greases
- process fluids
- fuel and lube oils

SPECIFICATIONS: This Purolator filter—model G-141J—is designed for filtration in a range upward of 40 microns.

It can be installed on pressure or suction side of pump.

It is recommended for capacities of from 6 to 200 GPM, dependent on viscosity. Spacing varies from .0010 to .020.

Relief valves set from 10-12 (generally 15 to 20) to 50 PSI are incorporated in several models.

Motor driven knife blade to clean element can be furnished whenever conditions make manual rotation impractical.

Maximum pressure: 125 PSI; Weight: 37 lbs. Equipped with simplex full-flow metal element oil strainers.

Available in all stainless steel construction for corrosive liquids, process fluids, food products.

If this filter's specifications recommend it for a problem of yours, write for catalog sheet to Dept. PF2-73.

Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada

For more facts circle 581 on Reply Card

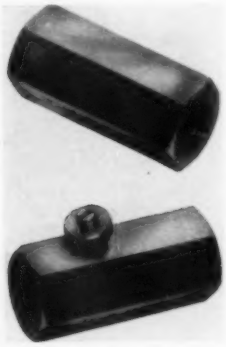
NEW PRODUCTS

(Begins on page 138)

ities from 12,000 to 32,000 lb per pair. Each leg of the end frames has a steel base plate, pre-drilled for anchoring to floor. Chicago Tramrail Corp.

20—CONTROL VALVES for hydraulic and gas uses

In this line of check and flow control valves, a "straight-through" ball-valve design is incorporated to enable increased flow, greater dependability and a marked reduction in friction. Metal-to-metal seats and "free-ball" mounting



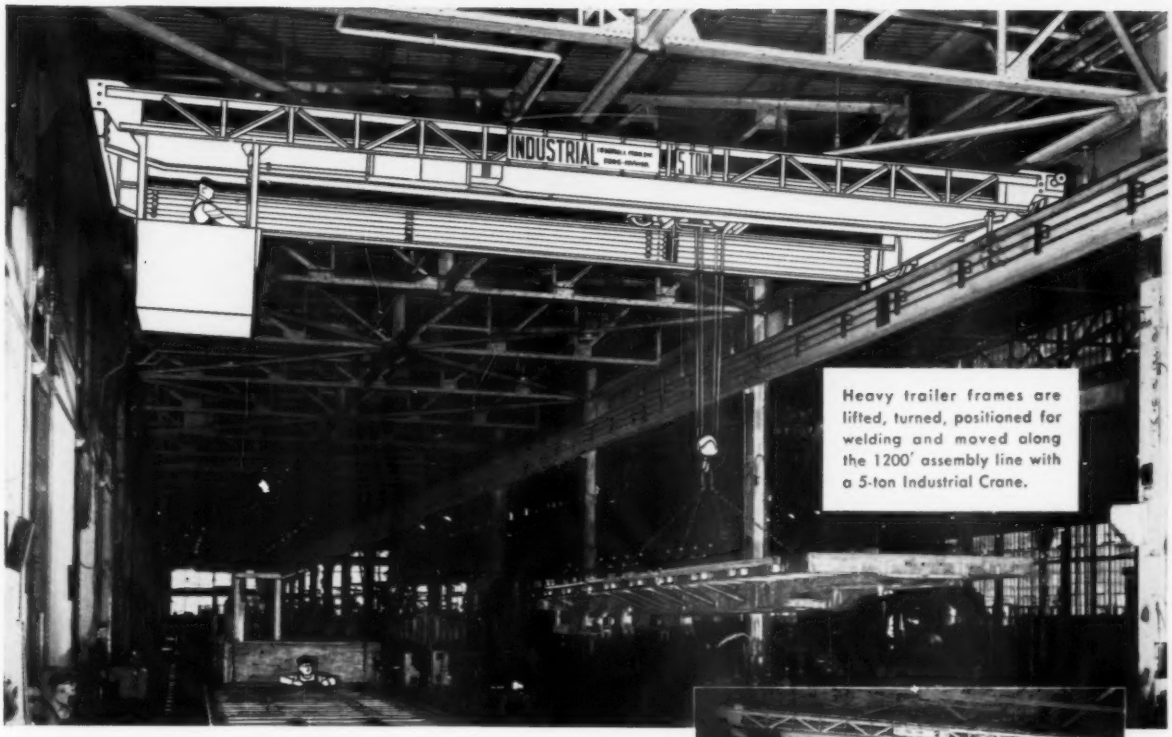
are used for lower maintenance costs and more consistent flows. The valves are female threaded to dryseal specifications in standard IPS ⅛ to ¾ in. and available from stock in brass, in steel, aluminum, stainless and special alloys to order. They may be utilized in pressure ranges to 2000 psi and are said to be particularly adapted to high or low temperature ranges. Flow control valves are adjustable before, during and after installation. Sensitive adjustment is attributed to the design which controls the valve-ball itself rather than the passage. True-Flo Valve Div., Mystic Machine Co., Inc.

21—CHEMICAL kills woody vines, many perennials

Bindweed, Canada thistle, trumpet vine and other tough broad-leaved perennials can be eliminated for a year or longer by one spraying of Tryben 200, it is announced. According to company, many species which can be controlled with Tryben 200 under varying conditions have responded to other weed killers only at critical stages of growth, if at all. This new material is based on the dimethylamine salt of trichlorobenzoic acid (TBA). Effective through both contact and residual action, it fits into chemical weed control programs as a single treatment where both types of herbicidal action are required for long-lasting control.

Tryben 200 is non-selective and is

7 more Industrial Cranes speed production here . . .



Heavy trailer frames are lifted, turned, positioned for welding and moved along the 1200' assembly line with a 5-ton Industrial Crane.

Another manufacturer of highway trailers chooses Industrial!

A leading manufacturer of truck trailers uses *seven* 5-ton **INDUSTRIAL** top-running, double-girder, motor-driven cranes in its midwest plant. Two assembly bays, each 1200 feet long are served by one cab-controlled and four floor-controlled **INDUSTRIAL** cranes, moving materials and heavy frames along the assembly lines. Two other floor-controlled **INDUSTRIAL** cranes handle materials in the machine shop.

Constant, regular use in rugged service such as this proves to **INDUSTRIAL** users that *Industrial Cranes are best for the long run.*

- Industrial builds a complete line of cranes for every need. Write for catalogs.

Agents in all principal industrial cities.

Find Your Nearest Dealer In The Yellow Pages

Floor-controlled assembly crane

Two floor-controlled Industrial 5-ton cranes move these heavy duty goose-neck trailers along a 1200-foot assembly line. The frames weighing 7000 lbs. and more are placed with precision and speed.

One hand control

Industrial's exclusive control box design makes one-hand control easy.

Industrial CRANES

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For more facts circle 582 on Reply Card

Each of the two illustrated troughs can carry as much cable as all of the paralleling conduit

Cope cable trough saves steel by the ton!

Problem. 100 miles of cable to be supported in a New Jersey power generating station.

Solution. A careful cost analysis of available methods and materials convinced plant engineers that Cope's expanded-metal cable trough was the best choice. Why? Among other reasons, it meant a saving of more than a ton of steel for every 60 feet of trough installed, as compared to conduit . . . a total saving in excess of 250 tons of steel for the 15,000 ft. of trough required for the completed job!

Here's How You Save. *One* 10 foot section of 24" width Cope trough supports as many cables as 16 lengths of 4" conduit and it only weighs 54 lbs., compared to 575 lbs. for this same amount of conduit. This adds up to real economy regardless of the size of your installation. Cope's expanded-metal cable trough simply uses *less* steel to do the job and obviously this can mean substantial savings for you!

Cuts Labor and Maintenance Costs, Too. Design and construction features of lightweight Cope trough speed installation of space saving systems—even in the most cramped quarters. Easy-to-get-at trough simplifies cable inspection and repair . . . provides ready re-routing and facilitates system additions.

You save *three* ways when you specify Cope cable supporting equipment . . . trough, ladder or channel.

- **LOWER FIRST COST**
- **LOWER INSTALLATION COSTS**
- **LOWER SYSTEM MAINTENANCE COSTS**

Discuss these advantages for *your* installation with a qualified Cope representative—or write to T. J. Cope Division, Rome Cable Corporation, Collegeville, Pa.

T. J. COPE *Division*

ROME CABLE CORPORATION

For more facts circle 583 on Reply Card

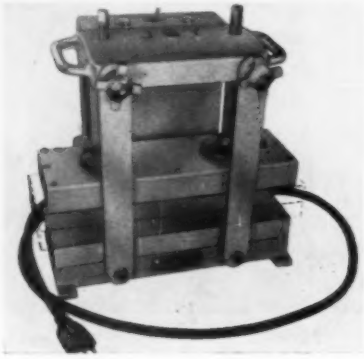
NEW PRODUCTS

(Begins on page 138)

formulated as a liquid to be diluted with water. Spray volume per acre depends on density and height of growth to be treated. Like many nonselective herbicides, this presents a potential hazard to certain sensitive crops, it is pointed out, and label precautions should be observed. E. I. du Pont de Nemours & Co.

22—VULCANIZING PRESS for electric cable

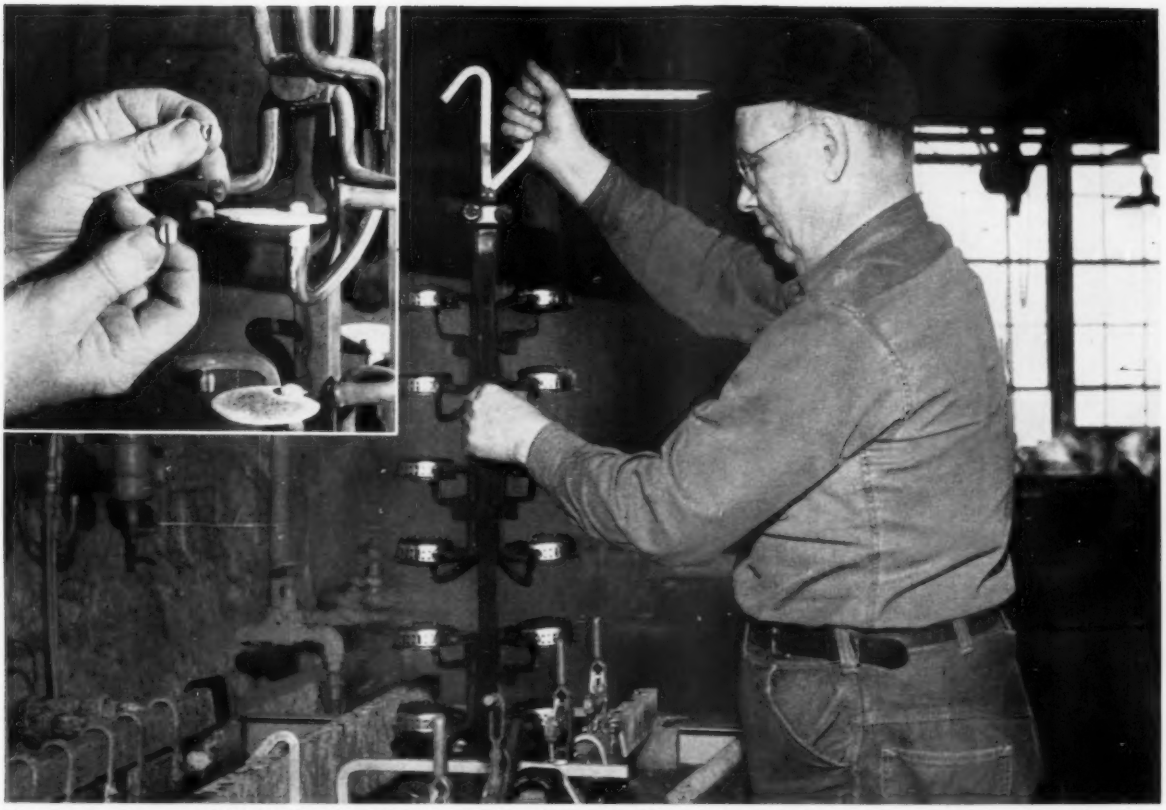
For reinsulating and rejacketing natural rubber, synthetic rubber and thermoplastic covered cables, this line of molding presses is designed to accommodate all standard cable types and sizes through the use of interchangeable aluminum molds. The presses carry a 3000-w rating and are



currently available for operation on seven standard a-c and d-c voltages. Heat from four replaceable strip heaters (two in the top and two in the bottom platen) is applied directly through molds to areas being vulcanized at molding pressures to 25 tons. A departure from previous designs employs twin tie bars that can be dropped for front loading and permit using press to create Y- and T-splices. These vulcanizers accommodate rectangular shaped molds up to 6-by-6-by-24 in., and can be used in tandem for longer cable. Joy Mfg. Co.

23—V-S CONTROL SYSTEM regulates the load

For use on grinding mills or similar equipment, this system consists of company's Varidrive, with Varitrol automatic control, driving the feed conveyor and an a-c constant speed motor operating the mill. The Varitrol senses horsepower variation of the mill motor and automatically adjusts speed of the Varidrive operating the conveyor to the preset desired value of the mill motor—the latter determined by the



Electropolishing racks covered with HYPALON are in good condition after six months. If product changes make racks obsolete, new adapters can be mounted on existing splines.

IN ELECTROLYTIC POLISHING

HYPALON® Outlasts Other Materials 8 to 1

HYPALON's resistance to strong oxidizing chemicals can save you time and maintenance dollars. Every year the metal finishing industry spends millions of dollars maintaining plating and electropolishing racks. The reason: the protective coating on ordinary insulated racks often deteriorates in a short time.

In Cleveland, the Guarantee Specialty Manufacturing Company has been using a new type of electropolishing rack protected with a vulcanized cover of Du Pont HYPALON. Despite six months of exposure to phosphoric acid, no failure has been discovered. Three weeks was a good life for the ordinary coating on the old racks, yet recent examinations indicate that HYPALON will continue to give favorable performance.

Similar racks are in electroplating service at automobile plants. Reduced downtime is saving money, but there are other advantages for electroplaters. The tight bond between the rack and the vulcanized HYPALON cover eliminates pockets, and the smooth surface permits rapid run-off, reducing drag-out losses and the risk of contaminating solutions.

HYPALON offers more than resistance to chemicals. It's ozone-proof, and it performs well in temperatures up to 350° F. For more information on its properties and uses, mail coupon below.

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. . . through Chemistry

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E. I. du Pont de Nemours & Co. (Inc.)
Elastomer Chemicals Dept. PL-7
Wilmington 98, Delaware

Name _____
Firm _____
Address _____
City _____ State _____

For more facts circle 584 on Reply Card

"A STITCH IN TIME" SAVES DOWNTIME

In other words, a "test in time" often avoids a costly machine outage, production loss and serious maintenance expense. The Test Record shown here is an example of how periodic measuring with a Megger® Insulation Resistance Tester gives you advance warning of impending trouble on an electric motor. This motor was repaired on a planned outage rather than under emergency conditions. Other dependable Biddle testing instruments are equally useful to detect trouble before it develops.

MEG® TYPE OF MEGGER INSULATION RESISTANCE TESTER— Available hand-operated, rectifier operated, or with a separate rectifier. Ranges up to 2000 megohms and 1000 volts d-c in all three models. BULLETIN 21-45-PL

SPEED MEASURING INSTRUMENTS — Frahm®, Jagabi®, Dr. Horn, Metron, Jones Tachometers, Jagabi Speed Indicator and Jagabi Tachoscope. There's a Biddle tachometer to suit every maintenance need—to check speeds accurately for load, friction, power transmission and lubrication. BULLETIN 35-PL

MEGGER GROUND TESTER measures the resistance of earth to ground connections simply, easily and accurately, and thereby helps to determine whether such connections will perform the services for which they were designed & installed. BULLETIN 25-PL

MEGGER LOW RESISTANCE OHMMETER — Battery or rectifier operated. Four ranges 0-1000 microhms down to 0 to 1 ohm. New clamp type test leads 18 ft. long enable one man to make tests. BULLETIN 24-46-PL

. . . serving your industry since 1895

B-805

JAMES G. BIDDLE CO.

Electrical Testing Instruments • Speed Measuring Instruments
Laboratory & Scientific Equipment
1316 ARCH STREET, PHILADELPHIA 7, PA.

For more facts circle 585 on Reply Card

NEW PRODUCTS

(Begins on page 138)

characteristics desired in the material being processed. The system will maintain the work load within 10 per cent of the desired value, says manufacturer. A dial control permits load level to be shifted between 25 and 100 per cent of full load rating of mill motor. U. S. Electrical Motors, Inc.

24—MAINTENANCE TRUCK has high-ladder extension

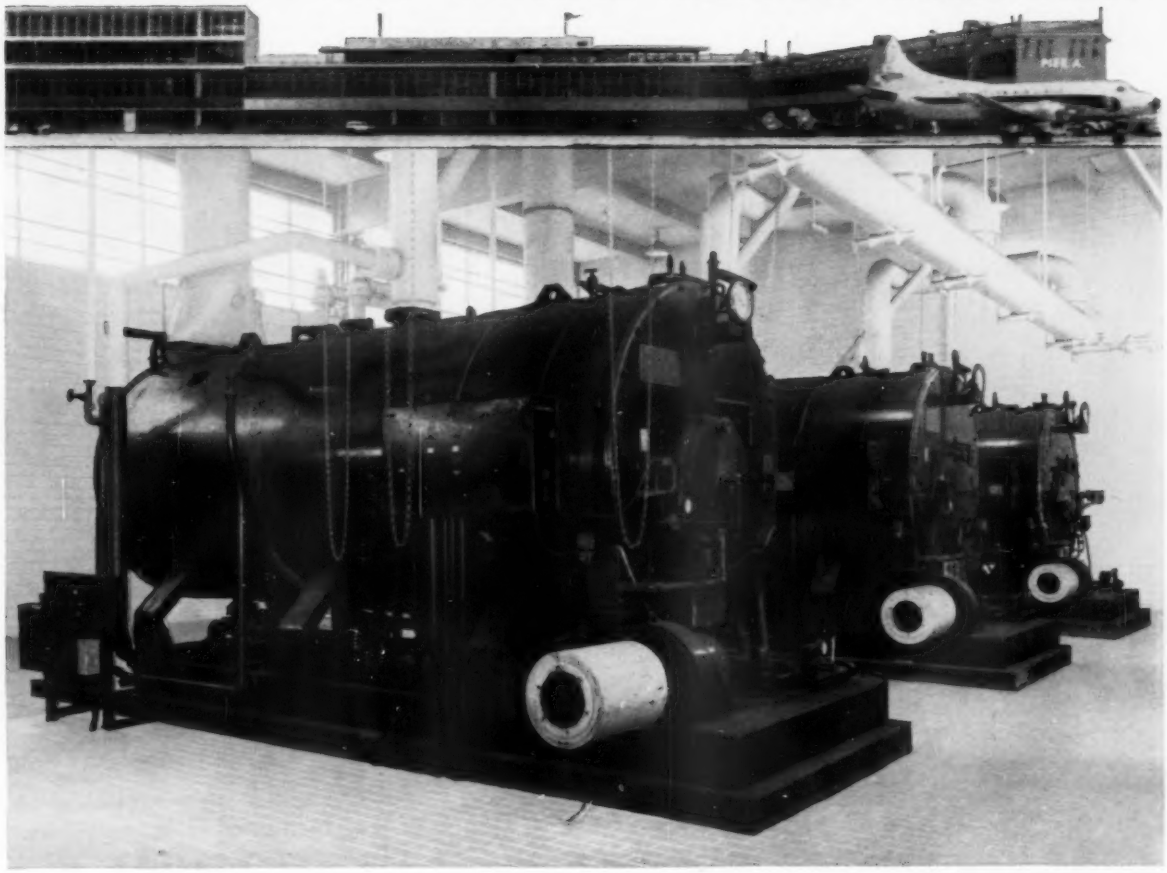
The HL-1 is announced as a compact, mobile unit which can be extended to give safe working footing 8 ft 3 in. off the ground, enabling a practical reach to 16 ft—yet when telescoped is low enough to pass through standard 6 ft 8 in. doorways. Ladder extensions

are locked in place by double, independent locks which can be released only by operator using one hand on each at once. Release of one lock alone will not let ladder come down, says manufacturer. Retractable front casters put it on legs for firm, positive bearing on floor, one leg being adjustable to compensate for uneven floor surfaces. Its caster-jack mechanism is such that normal "unlocked" position is with legs bearing on the floor. When mobile, casters are locked down, lifting legs up. Of welded steel sheet and tube construction, with aluminum upper extension carrying workshelf and guardrail, truck weighs only 166 lb. Rol-Away Truck Mfg. Co., Inc.

25—AC- MOTORS in NEMA rerate specifications

This line of a-c motors takes advantage of technical improvements and high-temperature resisting insulations to achieve lighter weight, more compact size and greater economy. It is pointed out that company's standard frame 1-hp, 1800 rpm, open dripproof, squirrel cage motor weighs about 74 lb, whereas the new rerated one of the same characteristics weighs 65 lb.

HEAT FOR A MAJOR AIRPORT



...CALLED FOR CLEAN, AUTOMATIC, EFFICIENT

AMESTEAM GENERATORS

Philadelphia International Airport is typical of our excellent air-age installations. In keeping with its modern facilities, Philadelphia's authorities selected these three 300 H.P. AMESTEAM GENERATORS for clean, automatic, dependable heat.

It is no coincidence that so many progressive organizations and firms choose "AMESTEAM" — its reputation for dependable performance goes back 110 years! Thus, when you get an AMESTEAM GENERATOR, you get the very best practical developments from this long experience. You get efficient Ames 3-pass fire-tube design that occupies minimum space. You get complete package construction with all parts furnished and backed by a single reputable manufacturer. You enjoy competent Ames 24-hour service.

In short, you're actually buying the low-cost steam that only a quality boiler can deliver. It's worth investigating!

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Please send me engineering details on AMESTEAM GENERATORS and name of nearest AMES representative.

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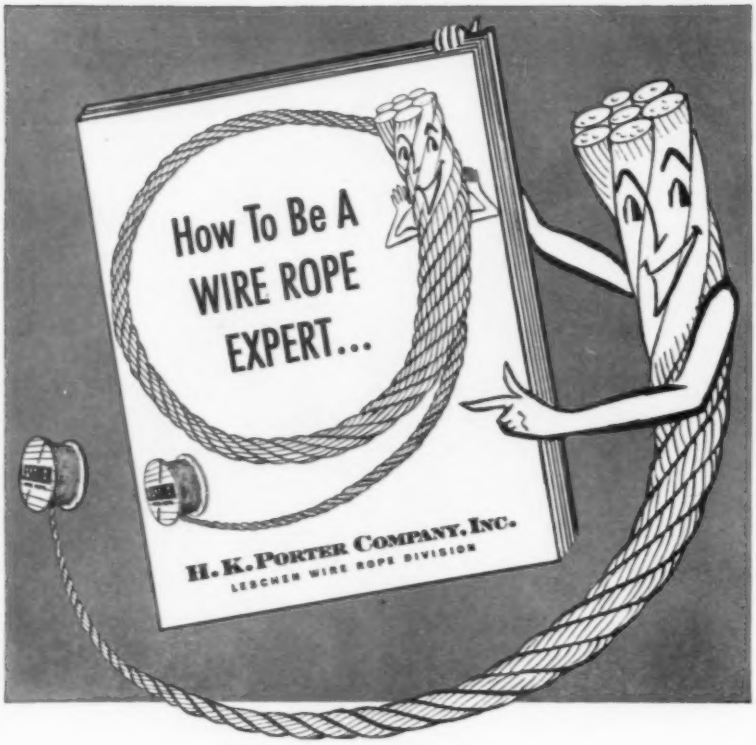
know wire rope...
send now for free 16-page guide



Yours for the asking...Illustrated 16-page book of pointers on how to select the right wire rope for any job!

Knowing how to select the best wire rope for the job not only helps reduce costs, but it may also help you to get that job done more efficiently. You'll find the facts you need to know in the book shown above. It has been specifically edited and illustrated for easy understanding by non-technical readers. It describes the forces that tend to destroy wire rope and then, step by step, shows how to determine which wire rope construction will provide the greatest possible resistance to the destructive forces you have found most troublesome. It's an interesting and helpful aid that every wire rope user ought to have. Send for free copy today. Write H. K. Porter Company, Inc., Leschen Wire Rope Division, 2727 Hamilton Ave., St. Louis 12, Missouri.

LESCHEN
Red-Strand
WIRE ROPE

H. K. PORTER COMPANY, INC.
LESCHEN WIRE ROPE DIVISION

For more facts circle 587 on Reply Card

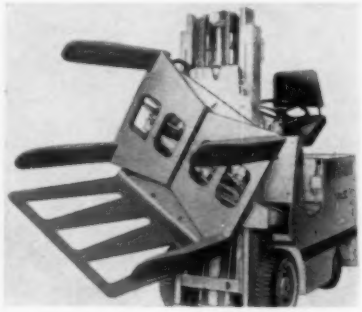
NEW PRODUCTS

(Begins on page 138)

with output the same as the motor with the larger frame. Temperature rise remains 40 C. Bulletin 860 gives details. Brook Motor Corp.

26—ATTACHMENT inverts liquid containers in storage

Designed to invert containers of liquid in storage to prevent "settling out," this lift truck attachment was developed to handle palletized loads of containers, particularly soap, paints and foodstuffs where separation of



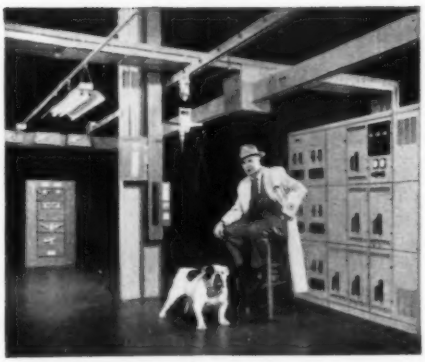
material in storage causes a problem. The attachment uses two pairs of hydraulically operated forks, the lower pair fitting into the pallet on which the containers are stored and the upper pair bringing an empty pallet down on the top of the load to hold it securely in place. With load thus secured, attachment rotates 180 deg to position it upside down on the second pallet. The pallet formerly on the floor is removed by raising upper set of forks. As a safety feature, a wide side plate is bolted between attachment forks to prevent load slipping out from between pallets during rotation. If side plate is not required for safety, 270 or 360 deg of rotation can be provided. The Yale & Towne Mfg. Co.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 169-170.

27—VERTICAL MOTOR for indoor, outdoor service

The Climatized Vertical Hollow Shaft Motor is announced in ratings to 2000 hp for indoor and unprotected outdoor service in pumping applications. Its design is claimed to offer greater compactness and to incorporate insulating materials with optimum resistance to moisture and chemical contaminants and high mechanical strength

Aluminum Lo-X®—*easy to install, economical, efficient*



VERSATILE ALUMINUM Lo-X combines with BullDog Plug-in-Duct, power panels, substations, Trol-E-Duct®, switchboards, safety switches and Electri-Centers® to form a coordinated distribution system that delivers power when and where you need it.

Our field engineer explains how easily Lo-X BUStribution® duct installs. All Lo-X bus sections have rigid scarf-lap joints which can be connected with just a wrench and screw driver. And light aluminum bus bars put less strain on building superstructure.

Even before Aluminum Lo-X is installed you can know what the voltage drop and operating temperature of the feeder system will be. Lo-X saves space, too! It installs edgewise, flatwise, even around corners—is factory prefabricated to fit your building structure.

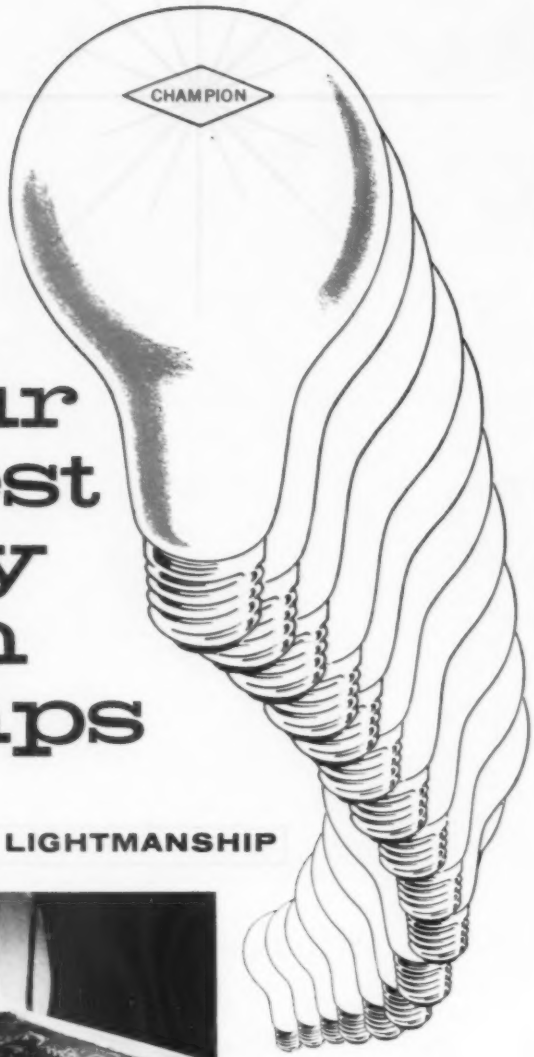
Look into Lo-X and its partner Plug-in-Duct®. Contact your electrical contractor or BullDog field engineer or write BullDog Electric Products Co., Detroit 32, Mich. © BEPCO

BULLDOG

BullDog Electric Products Company, Division of I-T-E Circuit Breaker Company, Detroit 32, Mich. *BullDog Export Division:* 13 East 40th St., New York 16, N.Y. *In Canada:* BullDog Electric Products Co. (Canada) Ltd., 80 Clayson Rd., Toronto 15, Ont.

HEAT BETTER ELECTRICALLY

For more facts circle 588 on Reply Card



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thanks to
CHAMPION LIGHTMANSHIP

MILLIONS OF LAMPS A YEAR . . .
ONE PLANT standard of quality control

TEST . . . TEST . . . TEST . . . Continuous testing is one of the many ways Champion applies LIGHT-manship to make sure that every Champion Lamp is uniform in life and light output . . . that you don't have to worry about early burn-outs and early dim-outs when you use Champion lamps.

Send for the New MAINTENANCE MANUAL. 48 pages of practical suggestions for making the most of your lighting system.

CHAMPION LAMP WORKS
Lynn, Massachusetts
A division of Consolidated Electric Lamp Co.

CHAMPION Lamps
Incandescent Fluorescent
Your best buy in lamps

For more facts circle 589 on Reply Card

NEW PRODUCTS

(Begins on page 138)

for added life. A maximum of two-high angular bearings are used in the motor to prevent excessive wear and reduced thrust capacity. Water-cooled Kingsbury type thrust bearings are utilized in extra-high thrust applications. For bearing protection the motor has an oil-metering system, sealed bearing chambers and Alnico magnet drain plugs to collect foreign ferrous particles in the oil. Because of high motor efficiency a minimum of cooling air is required, company points out, and this permits low cooling air velocity and prevents dust and moisture from being drawn into the motor by air stream. Further details are in Bulletin 2450. The Louis Allis Co.

28—PRESSURE REGULATOR protected against corrosion

Series 20AP Water Pressure Regulators have a heavily brass-plated, zinc, die-cast body containing other parts specially protected against corrosion.

With such protective features, the regulators are claimed to provide accurate pressure control in spite of fluctuations in primary pressure and in rates of water flow. They are designed for large volume flow and for quick response to sudden demands for greater volume. Regulators are offered in pipe sizes from ¼ through 1 in. in three pressure ranges—0-50 psi, 0-125 psi, 0-250 psi—each suited for line pressures to 400 psi, temperatures to 200 F. C. A. Norgren Co.

29—CONVEYOR BELT can be reversed for more wear

Named for its ability to absorb and distribute shock, the Shockmaster Belt is designed to be turned over after the first carrying side is no longer satisfactory. It is described as a medium weight, double duty belt, flexible and having high impact resistance for use over smaller than usual pulleys on short center hauls. Shock-

Simplicity in steam traps can effect big savings in parts inventory and maintenance time

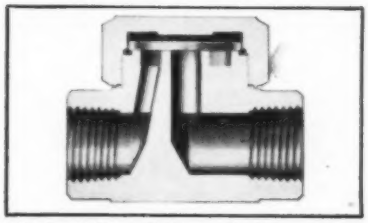
by John W. Ritter, Test Engineer
SARCO Company, Inc.

The function of all steam traps is to release condensate and prevent steam loss. However, the method of trapping can make a great difference in cost and effectiveness.

In the Sarco Thermo-Dynamic Steam Trap, the method is fundamental. Air or condensate entering the trap must flow from the inlet tube, radially across the underside of the disc valve, to the outlet. The space between the inlet tube and the disc forms a nozzle in which the static pressure energy of the incoming fluid is partly changed to velocity across the underside of the disc, with a resultant *decrease* in pressure. (This will be recognized, of course, as the Bernoulli Principle.) Use of this fundamental method means reliability in operation.

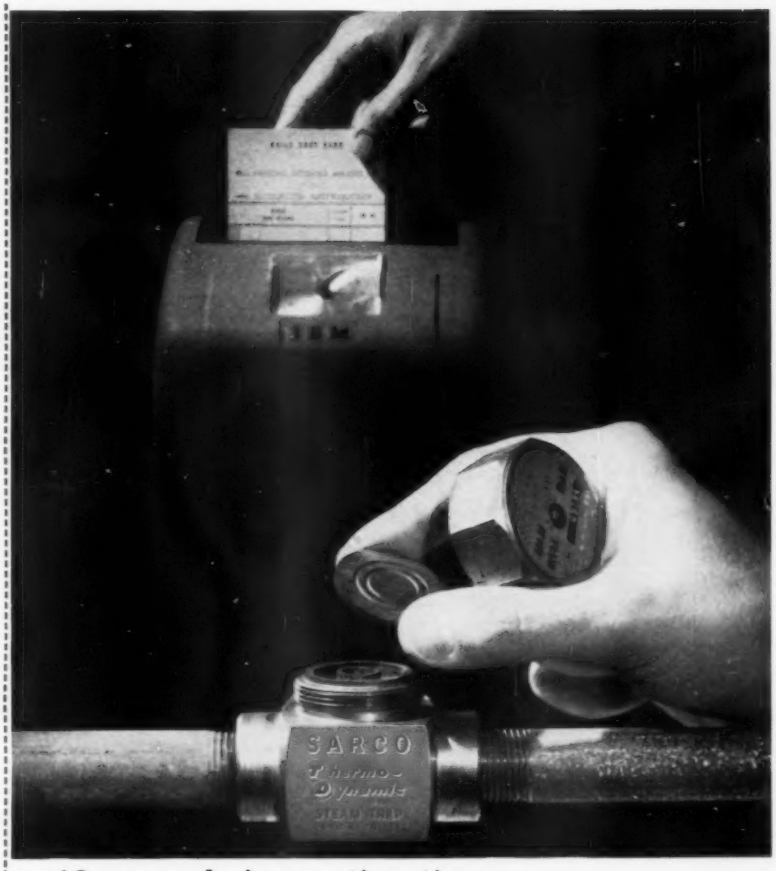
As the high velocity fluid jet strikes the side of the upper chamber, some recompression takes place, so that the pressure above the disc becomes greater than the pressure below it. The pressure reduction under the disc and the pressure recovery above it depend on the internal energy of the fluid. As the condensate above nearly approaches steam temperature, its internal energy is enough to overcome the upward force at the inlet tube and the disc snaps down in the inlet tube, which is the inlet valve seat.

Simultaneously, the disc also seals the outer ring, which isolates the space above the disc from the outlet. The disc valve is therefore held firmly against the inlet valve seat until the pressure in the control chamber is reduced by condensation. The upward force then exceeds the downward force and the disc valve opens.



This 3-part Sarco TD Steam Trap has only one moving part—the hardened, polished stainless steel disc.

No other trap uses the velocity of the fluid to operate the valve or uses the recompression of the flowing fluid to trap the valve closed and to hold it closed. When it closes, it closes tightly – no "operating steam" leaks out.



40 seconds inspection time— that's all it takes for a SARCO TD Steam Trap

Just back off the cap of a Sarco TD. Lift out its single moving part, the stainless steel disc. Wipe it off, and drop it back. No adjustment is ever required, at any load or any pressure in its range – from 10 through 600 psi.

The TD operates in any position, won't blow steam at any load. Small as a tee fitting, it can be installed in tight places. Its versatility and reliability cut cost of big replacement inventory.

Write for "Literature Kit 2A" today and get latest bulletins on the TD Steam Trap and other Sarco steam traps. Remember that Sarco can give you impartial advice on *Production Planned steam trapping* because . . .

5605-B

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COMPANY, INC.
635 Madison Ave., New York 22, N. Y.

Only Sarco makes all 5 types:
Thermostatic • Liquid Expansion • Float Thermostatic
Thermo-Dynamic • Bucket

STEAM TRAPS • TEMPERATURE CONTROLLERS • STRAINERS • HEATING SPECIALTIES

For more facts circle 590 on Reply Card

GARDNER DENVER

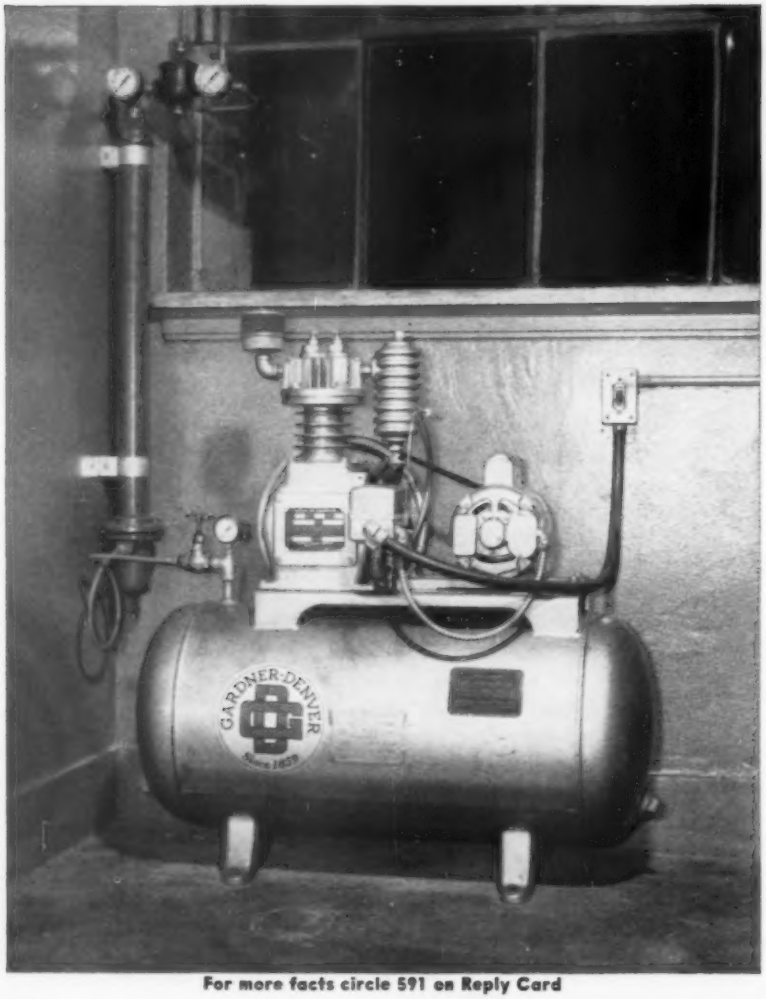
Hook up a small and compact Gardner-Denver CACB compressor and be sure of the pure, oil-free air you need for instrumentation, processing or the manufacture of chemicals.

The CACB uses no oil in the cylinder. Pistons and piston rings are made of self-lubricating carbon—no oil or water lubrication required. This highly efficient compressor supplies four to five cu. ft. of low-cost oil-free air per min., with discharge pressures from 40 to 100 psi. Write for complete information.

Stationary air compressors . . . tank-mounted compressor outfits . . . oil-free air compressors—whatever your compressed air needs, see your Gardner-Denver compressor specialist first. Gardner-Denver Company, Quincy, Illinois.

Low-cost . . . oil-free air

Compact CACB compressor



For more facts circle 591 on Reply Card

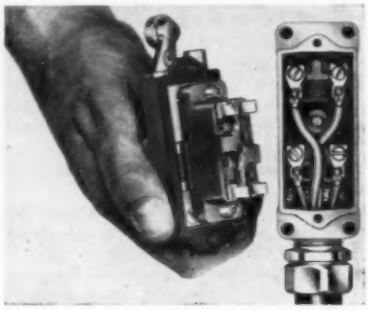
NEW PRODUCTS

(Begins on page 138)

master is made of two- or three-ply heavy cotton nylon fabric with a skim coat of rubber between plies. An envelope ply of frictioned, double skimmed, heavy open weave nylon encompasses the core and acts as a cushion. Top and bottom covers are abrasion resistant rubber, 3/32 in. thick. This construction makes the belt unusually flexible without loss of bulk or strength, says manufacturer. This belt is reported particularly advantageous where 45-deg idlers are necessary on narrow belting. Quaker Rubber Div., H. K. Porter Co., Inc.

30—LIMIT SWITCH with reversible plug-in unit

Designed for easy installation, the base receptacle of this oil-tight plug-in limit switch can be mounted and wired without disassembly. The plug-in switch mechanism is reversible, and can be plugged in with the roller arm



at either top or bottom. The receptacle can be mounted on its base or on either side, with conduit opening at top or bottom. Combined with the reversible plug-in unit, this provides six different mounting arrangements. In addition, switch action can be reversed by a screwdriver adjustment. The precision switch requires only 5 deg to operate, provides for 25 deg overtravel. Graduated markings around hub simplify accurate settings. Bulletin 9007-AW gives details. Square D Co.

31—REPAIR KIT improved for wider application

For wider application of epoxy resin compounds, the new Sonite Repair Kit contains improvements suggested by users who applied original kit to maintenance problems in their own plants. Addition of Metalset A-4, an aluminum epoxy cement, means that the kit can now be used for smaller repairs, such as cracks and seams, as well as for larger areas where patching is re-

(Begins on page 138)

quired. (Originally the kit was designed solely for patching jobs.) Another new feature is 4-in. glass tape, with woven edges to minimize fraying. According to manufacturer, the tape replaces glass cloth formerly included, because tape is easier used and found to be needed more often than cloth.

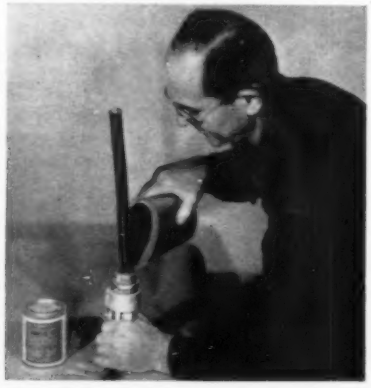
Other new features include a minimum toxicity hardener that is slower acting than previous types, allowing more time for repairs. Aimed at cutting down waste is the repackaging of the resin and hardener in smaller units proportioned for immediate, one-step mixing. Each container of resin is large enough to mix in a unit of the hardener. Smooth-On Mfg. Co.

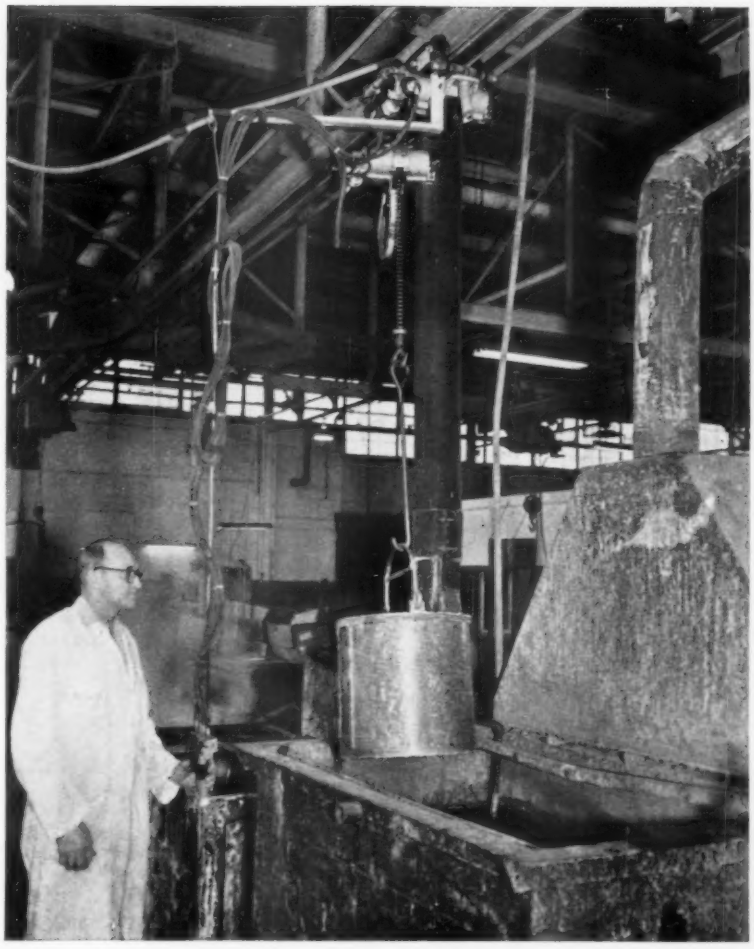
32—RUST PREVENTIVE is non-flammable, non-toxic

Packaged in a 16-oz aerosol container, Anderol L-536 Rust Preventive is claimed non-toxic and non-flammable and to protect all types of metal products and machinery from rust. Spray application provides a continuous light film protection which, in most cases, does not have to be removed before final finishing. This product is reported to have application in plants requiring rust protection of dies, molds, assemblies, parts etc., during manufacturing, storage or downtime, and in particular where the hazard of fire exists. Lehigh Chemical Co.

33—CORD CONNECTOR for hazardous locations

Type CGBS, announced as an explosion-proof connector, provides for sealing the cord on portable equipment for use in hazardous locations. Sealing compound is poured when connector is installed. A wire ring holds cord in compound, which hardens to create an effective seal. The clamping nut has an integral cord clamp to assure positive locking action on the portable





New Hoistractor

does the pushing and pulling

Let air muscle replace your tug-shove methods of moving heavy hoist loads. The new air-powered Keller Hoistractor can provide any beam hoist with the push-pull power needed to make load spotting and moving an easy task. It connects to the hoist by drawbar, rides the same beam . . . can move loads up to two tons. One simple hand control provides instant command of both "up-down" and "push-pull" operations.

Write for Bulletin 87-1 for complete details.

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engineered and standardized by

MATHEWS

Lines of roller conveyer used for packaging of tractor repair parts where orders are made up for shipment.

The Mathews line of roller conveyer is complete, with rollers ranging from 1-⅜" to 6-½" in diameter, and with capacities from 60 lbs. to 13,000 lbs. High quality ball bearings are used throughout.

Accessories such as turntables, hinges and switches are available from stock.

A full line of couplings and supports makes the installation of Mathews Roller Conveyer lines convenient and easy.

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NEW PRODUCTS

(Begins on page 138)

cord, and prevent accidental withdrawal from connector. Connector is available in sizes to fit cord from ¼ to 1-3/32 in. diam. Crouse-Hinds Co.

34—GATE VALVE features a cylindrical body

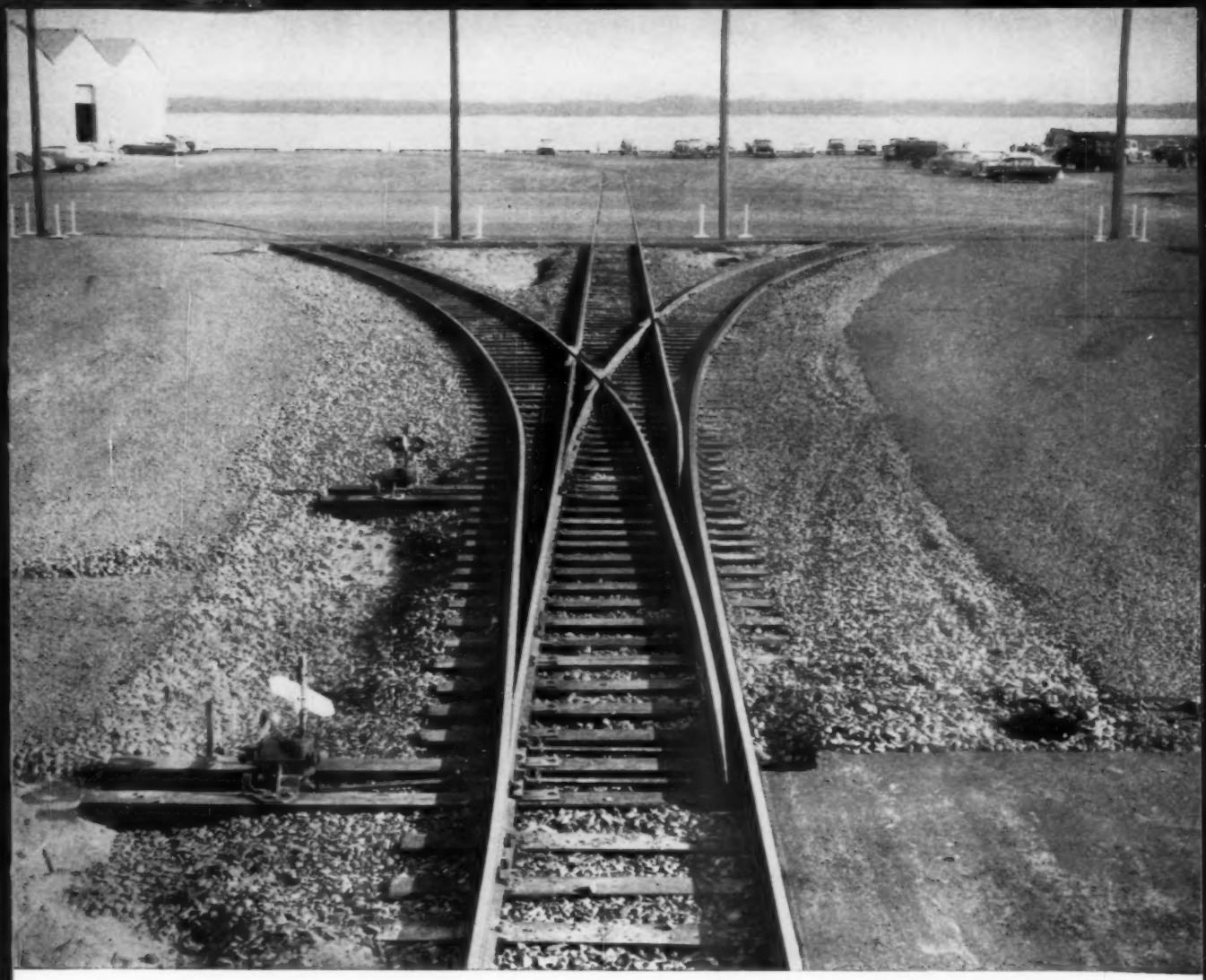
Outstanding feature of this 200-lb bronze gate valve is the cylindrical body which is said to provide considerably greater resistance to line

distortion and internal pressure. Expanded-type, chromium steel alloy body seat rings can't loosen in service, company says, and wear-resistance wedge disc is easily replaced. The valves are offered in both the rising stem and non-rising stem patterns in sizes ¼ through 3-in. Crane Co.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 169-170. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

35—RUGGED PUMPS for the abusive applications

Pumps in the K series are designed for applications involving abrasion, corrosion or handling of hot liquids. Manufacturer says they are especially suited for hot liquids because of the exposed shaft design. The pumps can be stationed above or below sump liquid level. These are single stage, end suction pumps in sizes from 1 to 10 in. for heads—in some cases—up to 250 ft or more and for capacities in the range of 4000 gpm. There are three basic designs. Type KR, for limited heads, has end plate secured to housing by removable dogs. Type KC for corrosive or mildly abrasive ap-



Contractor: Stock Construction Corporation, N. Y.

Trackwork at Port Newark pre-curved, pre-drilled and pre-cut to reduce installation costs

21 turnouts, 1 crossing, approximately 80 feet of curved rail, and 280 feet of straight rail were all pre-cut, pre-drilled, pre-curved (where required) and "match marked" for a fast, easy, economical trackwork installation at the Norton, Lilly & Company's steamship terminal in the Port of New York Authority's Port Newark. Complete pre-fabrication at the plant saved many thousands of dollars in labor costs at the site.

Perhaps complete shop pre-fabrication is the answer to your turnout installation costs. Why not discuss this matter with one of our engineers? He will gladly point out its advantages, and also tell you about the dozens of "little things" that make USS Industrial Trackwork the finest you can buy.

For a copy of our catalog, "USS Industrial Turnouts," write to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pennsylvania. We will send it to you without charge.

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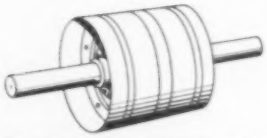
Amazing new ceramic permanent magnet material inspires revolutionary developments in tramp-iron protection.

First to take advantage of the remarkable magnetic properties of Indox V is Stearns — the leader in design and development of magnetic equipment for more than 40 years. *Only Stearns uses Indox V* in magnetic tramp-iron separation equipment. Here are four brand-new Stearns separators that are introducing a new era of tramp-iron protection for all industry.

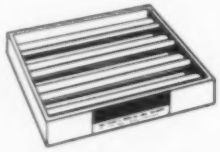


NEW INDOX V MAGNETIC PULLEY

Installed at head of belt conveyor system, outperforms conventional permanent magnet pulleys, equals deep-field power of electromagnetic types. Radial design boosts holding efficiency for maximum separation. Standard widths and diameters to match your present system. Ask for Bulletin No. 1021-T.

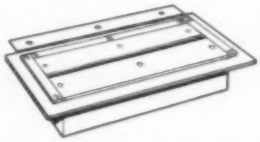
NEW INDOX V MAGNETIC DRUM

An ideal unit for process industries where granular materials are conveyed in enclosed chutes or spouts. Revolving stainless steel cylinder inside a welded steel housing carries material over stationary magnet assembly, which holds iron particles beyond discharge of non-magnetic product. Indox V produces exceptionally uniform field *30 to 40 percent stronger* than old-style permanent magnet drums. Complete range of types and sizes for any installation. Write for Bulletin No. 1051-T.



NEW INDOX GRATE MAGNET

Easily installed in any hopper or floor opening, chute or duct, guards your product and plant against dangerous tramp iron. Collecting tubes, with continuous magnetic poles along their entire length, leave no "dead" spots. Effective area is actually 400 percent greater than in ordinary grate magnets! Complete range of types and sizes for any installation. Bulletin No. 1072-T.



NEW INDOX V PLATE MAGNET

Provides separating efficiency far superior to ordinary plate magnets. Powerful, uniform magnetic field traps iron particles in flowing material in chutes, ducts, spouts or on conveyors. Excellent tramp-iron protection at low cost. Write for Bulletin No. 1073-T.

WHAT IS INDOX V?

Indox V is a highly oriented barium ferrite *ceramic* material. Its energy is comparable, on an equivalent weight basis, to that of Alnico V — the most powerful permanent magnet material available. Indox V magnets possess unique advantages — light weight, high electrical resistivity, great resistance to demagnetization, inexpensive, non-critical raw materials—plus an energy product over three times that of non-oriented ceramic magnets. Indox V is used in separators manufactured by Stearns exclusively.

STEARNS MAGNETIC PRODUCTS

A DIVISION OF THE INDIANA STEEL PRODUCTS COMPANY

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NEW PRODUCTS

(Begins on page 138)

plications, where frequent inspection is unnecessary, has a center split casing, the two halves being bolted to gether. Type KF, for high pressure abrasive or corrosive applications, has end plate secured to the housing by flanges and bolts. All types are available with simple slippage seal adjustment in bearing stand. Bulletin K gives complete data. Nagle Pumps, Inc.

36—HOIST HOOKS convert to safety hooks

Converting these hoist hooks to safety hooks can be done in minutes, company says, simply by adding a latch kit to the drilled cam integrally forged above

hook throat, and the loads cannot slip off or be jarred off. Kits consisting of latch, spring, bolt and self-locking nut are available to match every size of company's eye and shank hooks, from ⅓ to 150 tons capacity, and swivel hooks to 22 tons. Crosby-Laughlin Div., American Hoist & Derrick Co.

37—DEHUMIDIFIER is large, high capacity unit

Model 1500 is suggested for moisture control in warehouses and large storage areas, as well as in pharmaceutical plants and chemical processing facilities requiring a continuous supply of dehydrated air. It is designed to remove up to 40 lb of water per hour and to maintain humidity levels as low as 10 per cent rh. Machine uses two beds of permanent silica gel drying agent. While one bed removes moisture from the air, the other is regenerated by the most economical source of heat available, whether electrical, steam or gas. Alternate absorption and reactivation periods of the Model 1500 are spaced by adjustable timers to provide for economical operation under varying weather conditions. It requires only standard electrical connections a minimum of duct work for installation, manufacturer announces. It has safety devices to prevent overheating and can be modified to include explosion-proof

Solve cooling problems this month

COOL MEN, MATERIALS AND MACHINES WITH "HY-V"® AIR JETS

HERE'S A FAN that pinpoints a stream of cooling air as far as 74 feet at velocities up to 5780 FPM *without ducts*. That's the reason "HY-V" Air Jets are used so widely to reduce heat fatigue and keep production high at hot spots during summer months.

Year 'round jobs for these fans include air quenching, ladle and machinery cooling applications and other related uses.

One model is bracket mounted for installation on wall, ceiling or column, so fan is protected from trucks, and the cord is off the floor. The other has its own portable, wheeled stand for most flexible use in different locations. All "HY-V" Air Jets have heavy wire mesh safety guards. Fan quickly adjusts left or right, depresses to 45°.

Order now and beat the HOT WEATHER SLOW-DOWN!

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to our readers . . . .

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3	So You're Going To Overhaul Your Turbine Generator—48-page reprint of series of articles on details of U. S. Steel Co. 25,000-kw turbine overhaul.	1.00
4	Industrial Ventilation—8-page manual presents new, thought-provoking ideas on industrial ventilation. Such points as measuring and controlling radiant heat and how to find the comfort range are discussed.	0.25
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6	Fluid Power Maintenance—48-page reprint of series of 12 articles on hydraulic and pneumatic industrial applications.	1.00
7	Your New Industrial Power Plant—How To Get It Into Operation—24-page reprint of series of articles by Paul N. Garay from 1957 issues on building your new plant right, how to set up operating records and train operators, tools and stores, procedure in getting ready to operate.	1.00
8	Industrial Maintenance—36-page reprint of 11 articles appearing in past issues of Plant Engineering.	1.00
9	What It Costs to Modernize Small Industrial Power Plants—24-page reprint of series of articles by H. D. Fisher from 1957 issues, giving six case studies of plants from 25,000 to 50,000 lb. of steam per hour capacity.	1.00
10	Cherry Hill—16-page reprint of article describing what construction preplanning is necessary. Article discusses use of consultants, methods of bidding, basic concepts, selling the project to management, details of project and cost-saving ideas.	0.50
11	A Power Plant Primer—32-page reprint of article by A. W. Kramer explaining the fundamental principles of the steam-electric power plant and of each unit of principal equipment, showing how they all operate together to generate electricity.	1.00
12	Pumps—4-page reprint of article "Pumps—and Why They Have Troubles." Some of the points covered in article: sagging foundation, distortion of base plate, proper packing and its importance.	0.10
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NEW PRODUCTS

(Begins on page 138)

features. Each unit includes a humidistat to allow automatic control over a range of 20 to 90 per cent relative humidity. Dryomatic Corp.

38—FIRE FIGHTING UNIT is compact, easily used

The Fire Boss is a low priced, portable unit designed to place maximum protection within cost requirements of small operations. Its simple design allows even an untrained operator to use it effectively, says manufacturer, simply by opening the nitrogen source and hose nozzles. The unit uses invertible spheres to store 1500 lb of

nitrogen-propelled dry chemicals. While the unit is idle, outlets are at the top, above powder level, to eliminate possibility of clogging. In use, the sphere is automatically inverted to working position. After use, it is merely returned to original position.

Dry chemicals, propelled by high-pressure nitrogen flow, form the primary fire-fighting agent. However, eight assisting agents are also provided, including any combination of fog or straight stream with water, foam, wet water, or wet-water foam. A second spherical tank contains the water supply. Side tanks give additional capacity of 30 gal of 3 per cent foam chemicals, 30 gal of wet-water, and a total of 880 cu ft of nitrogen. The Neoprene hoses are always connected for use and mounted on continuous-flow reels. The complete unit is available mounted on truck trailer or skids. Fire Boss, Inc.

39—STEEL CHAINS stand heat and acid solutions

Two Chains, ACCO X-Weld Acid Pickle and ACCO X-Weld Type 321 Stainless Steel, are designed for optimum service in high temperature applications and in solutions of sulfuric or nitric acids as used in industrial pickling operations. Successful use in concentrations of sulfuric acid up to 20 per cent and at temperatures to 200 F is claimed for the acid pickle chain. Manufacturer says it will not scale below 1700 F and has long life when utilized below that temperature. The

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New RLM Specs for units utilizing high-output 800 milliampere lamps, point up the thorough broadening of RLM Standards to keep pace with latest lighting developments. In fact, every specification in the new RLM Book has been strengthened, made more embracing, revised UP! Send for your FREE COPY of the 1958 RLM Specifications Book.

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NEW PRODUCTS

(Begins on page 138)

stainless steel chain possesses desirable properties associated with 18-8 stainless steel. By use of a titanium addition, inter-granular corrosion in the carbide precipitation range of 800-1650 F has been eliminated, it is noted. Manufacturer recommends this chain for nitric acid pickling operations under high temperature and/or atmospheric oxidation conditions. Both chains come in five sizes from 9/32 to ¾ in. with working load limits of 1600 to 9850 lb. American Chain Div., American Chain & Cable Co., Inc.

40—HEAT EXCHANGER is small and compact

This line of small rotary, air-to-air heat exchangers can take waste gases at temperatures to 1000 F, it is announced. About 20 in. in diameter and 11 in. in overall depth, the rotary regenerative heat exchanger can handle flows of 250 cfm; larger units up to 4 ft handle flows up to 2600 cfm. Efficiencies of 90 per cent or more can be realized,

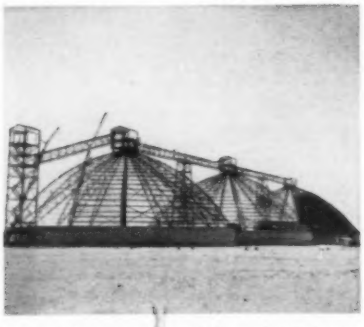
according to company. Arrangement of mutiple units in parallel with common ducting accommodate flow rates greater than 2600 cfm. Chief component of exchanger is the rotor with individual sector shaped baskets that contain the heating element. Seals and sealing surfaces remain plane and parallel to minimize leakage despite severe axial temperature gradient in heating elements during operation. Drive for rotary regenerator is a ¼ hp gearhead motor. The Air Preheater Corp.

41—VIBRATING SCREEN is heavy duty, horizontal

Straightline CL-Model 58 is a heavy duty horizontal vibrating screen. Designed for dewatering, washing, washing and sizing a wide variety of materials, where head room is limited, the

Steel Spiderweb

fabricated and erected by American Bridge



This project consists of 3 muriate storage buildings, 1 horizontal gallery, 2 intermediate support towers for horizontal gallery, 1 included conveyor gallery, and 1 junction tower.

This dome-shaped steel framework is part of a new product storage and reclaiming area recently built for the National Potash Company at Carlsbad, New Mexico. American Bridge, which fabricated and erected the entire structural framework for this important construction, used 505 tons of structural steel. Field connections were riveted, welded or bolted with high strength and ordinary bolts.

Each of the muriate storage domes is 185 feet across at the base. From the top of the foundation wall to the top of each dome is 69 feet. The foundation wall is 16 feet high. The crown ring which provides top anchorage for arched trusses is 83′ 8½″ above the finished floor of the building. There are sixteen panels in the roof structure of each building.

American Bridge has the experience, facilities and manpower to handle all types of structural steel jobs—conventional or complicated. Whatever your next building project, call American Bridge. Put our knowledge in structural steel construction to work for you.

Owner: National Potash Company

Designed by: Stearns-Roger Mfg. Co., Denver, Colorado and American Bridge Division

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For more facts circle 600 on Reply Card

NEW PRODUCTS

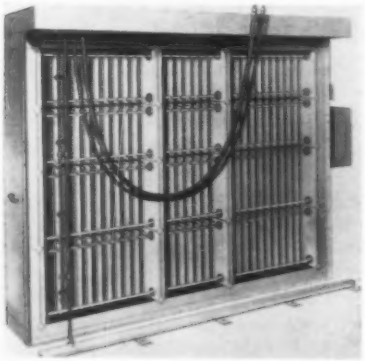
(Begins on page 138)

screen can be cable suspended or floor mounted; or a combination of both mountings can be used. This low-head-room screen achieves high intensity motion by centrifugal force, unbalanced shaft vibrators. Two eccentric shafts in the vibrator, supported by heavy duty oversize self-aligning bearings, are rotated by a helical gear speed reducer, giving the screen its straightline motion.

A feature is the vibrator gear mounting. To facilitate removal for replacement of cartridge-mounted bearing, the gears are mounted on tapered shafts. A positioning rod makes it possible to support the shaft during any bearing change and keep it in a central position. Link-Belt Co.

42—DUST PRECIPITATOR is high velocity unit

This manufacturer's Electro-cell is now offered in a unit operating at face velocities to 600 fpm. High efficiency is maintained while overall compactness has been improved, says manufacturer, achieving a size reduction of 30 per cent in the face area and 50 per cent in cubic requirement over conventional precipitators. In addition, it is described as 16 per cent shallower than many high-velocity units. Sectional construction is featured for easy assembly. Individual cells contain positive and negative

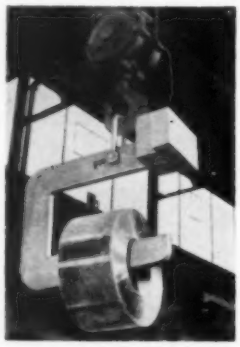


collector plates fixed in position. Each cell has its own set of vertical ionizing wires. This construction differs from the company's standard Electro-cell in that it eliminates a separate ionizer section. Both initial and installation costs are reduced, it is stated.

Aluminum collector cells come in heights of 16 and 20 in., in widths of 24 and 36 in. Cell capacity ranges from 800 to 2750 cfm. Collection efficiencies up to 97 per cent are reported. Bulletin 258 provides details. American Air Filter Co., Inc.

43—C-HOOKS prevent mar- or scratching surfaces

This line of standard design C hooks, in capacities from 4000 to 40,000 lb, incorporates a half-round bearing strip on the carrying lip to provide greater bearing on the coil and prevent



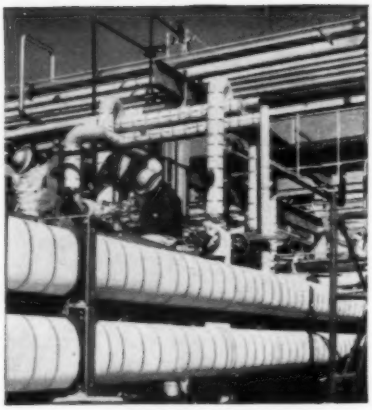
scratching or marring surfaces during pick-up and handling. These hooks are balanced to hang from crane hook in correct position for quick coil pick-up and accurate spotting when load is set down. Forged steel crane hook shackles are used, main member of hook is made of a single heavy steel plate, finished to shape, with rounded corners to prevent excessive stress concentrations, and to allow coil to butt squarely against back of hook. Cullen-Friestedt Co.

44—BRICK CLEANER in polyethylene container

Liquid Brick Bath is claimed to be as effective as muriatic acid in dissolving lime mortar and cleaning bricks—yet much safer and easier to use. It will not burn a worker, says manufacturer. The chemical comes in a polyethylene container that ships easily, weighs less than glass and is virtually unbreakable. This container makes Liquid Brick Bath simpler to use than many chemicals. The container, sealed in a corrugated box, has a self-pouring spout. Goldblatt Tool Co.

45—ACTIVATED DENSIFIER protects against dusting

Densicon 76 is announced as an activated densifier for concrete floor surfaces, which protects against chemical damage and dusting, while increasing resistance to traffic wear. The material is flowed on in liquid form with a long-handled brush and is said to penetrate deeply into capillaries and then crystallize to assure structural density. Manufacturer states that density provided by two applications, 24 hr apart, is equivalent to that of three coatings with concrete hardeners. Also, surfaces are claimed to breathe



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PHOENIX, Ariz., Kircher Asbestos & Rubber Co.
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GUSTIN gb BACON

Where plant production depends on temperature control- insulate with SNAP*ON!

The more process or steam piping you have in your plant, the more reason to use Snap*On—the one-piece pipe insulation molded of fine glass fibers. For Snap*On offers the *highest thermal efficiency at the lowest applied cost of any general purpose pipe insulation on the market* for cold or hot piping up to 350° F.

Thermal efficiency alone makes Snap*On the natural selection in plants where production hinges on piping—yet Snap*On offers many other outstanding advantages. It costs less to apply—"just open the seam and it snaps on the pipe." It's lighter and cleaner to work with. There is no breakage, no waste. It's permanent.

Snap*On is available in one-piece cylindrical sections . . in sizes up to 33" . . . plain or with a complete range of factory-applied jackets for appearance, vapor barrier or weatherproofing. It is stocked for prompt delivery by a nation-wide network of G-B distributors. Use the best —it costs no more.

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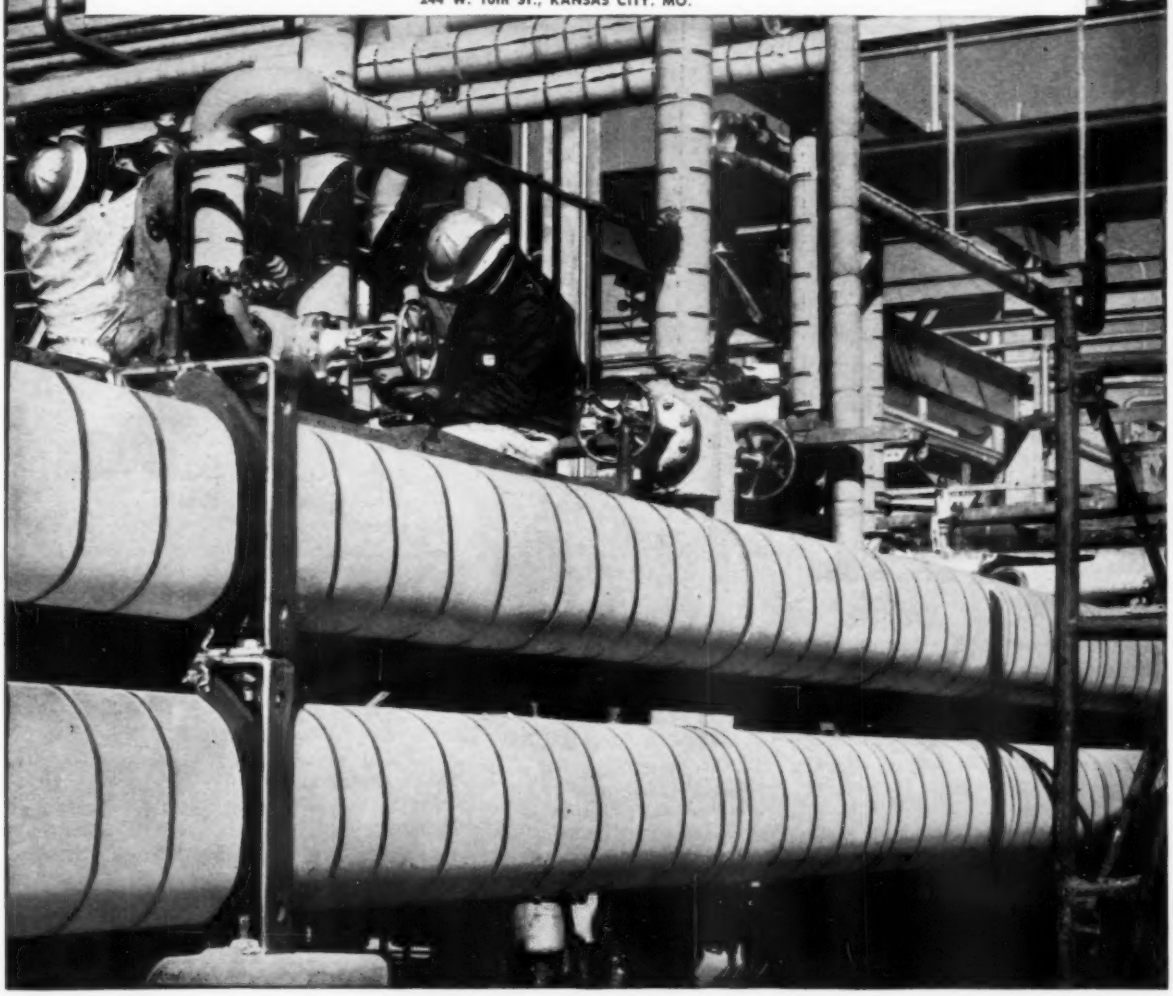


For more facts circle 601 on Reply Card

NEW PRODUCTS

(Begins on page 138)

and permit water vapor transmission and resist chemical attacks by vegetable and animal oils, coal tar distillates and dilute water solutions. Densicon 76 is non-flammable, odorless and does not darken surfaces on which it is applied, according to company, treated floors can be worked on immediately after application. It is furnished in dry form to be mixed with water. Maintenance Inc.

Use the Reader Service Cards provided on pages 169-170 to ask for more information on these products. Circle item numbers of products in which you are interested.

46—WOOD FLOORING for heavy-load "hot spots"

This end-grain hickory flooring is suggested for aisleways, intersections, loading docks, other areas that must

take concentrated loads and heavy traffic. It is reported to last 10 times longer than many floorings and to be easily installed. Individual blocks are available in thicknesses from 1 to 3 in. Gamble Brothers, Inc.

47—FORK TRUCK for loading box cars, trucks

This 4000-lb capacity, solid-tire fork truck, the Carloader 4024-S, has a wheelbase of only 40 in. It is designed for loading or unloading boxcars and trucks and for operation in low-stacking areas where maneuverability is required. Powered by a four-cylinder Continental engine of 124-cu ft displacement, the machine travels 7.4 mph forward and 6.3 mph in reverse, and will climb a 16 per cent grade loaded. Its lift spread is 30 fpm loaded. For short turns the rear steer wheels have 72 deg wheel angularity. Water, fuel and hydraulic filler caps are outside the engine compartment for accessibility. Clark Equipment Co.

48—TRAMRAIL TRACTOR for overhead systems

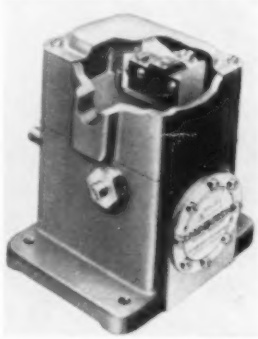
Type MT Tractor is driven by two 5-in. diam steel rollers under spring pressure against the bottom of the track. Rubber drive rollers are also available. The tractor is designed to develop a drawbar pull of 300 lb. It can be used as a single motor drive for one or more carriers in a train, and for motorization of hand power cranes and carriers. It is reported especially adaptable for systems with inclined tracks.

Minimum speeds are 50 fpm with a ½-hp motor, 75 fpm with a ¾-hp motor and 100 fpm with 1- to 2-hp motors. Maximum speed is 350 fpm. The MT Tractor is suggested for floor-controlled carriers or cranes and on automatic dispatch units. It can be used on platform or cab-operated carriers or cranes where subjected to average service. Both standard open bar collectors and Safpowrbar collectors can be mounted on this tractor. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

49—MOTION INDICATOR is low cost protective unit

Although primarily for process industries, the Roto-Guard is announced as applicable in other operations where positive indication of motion, or lack of motion, is required. This low cost protective device is a means of converting motion of various types into a signal. The signal impulse may be used to energize an alarm system or to operate control switches automatically. Roto-Guard is connected to any slow turning shaft and as long as the driven shaft rotates normally the Roto-Guard, by means of a circulating pump and pressure-actuated switch, indicates normal operation. Should the rotation of the driven shaft slow below operating level, or stop, the drop in pressure would set off the alarm.

The Roto-Guard can be wired into an interlock system. In this way stoppage of one component in the chain of



process equipment automatically will stop the other components to prevent damage, it is explained. The Roto-Guard is designed for operation at 10 to 150 rpm and is adjustable within that range. Form 3547 gives data on this. The Bin-Dicator Co.

50—FIN-LESS MOTOR for use around explosive dusts

Absence of external cooling fins is said to make these motors particularly suited for use in dusty or dirty atmospheres of an explosive nature, where accumulation around fins would be dangerous. According to manufacturer, this motor series is UL approved for Class 1, Group D (gasoline vapor), and Class 2, Groups F and G (explosive dusts) service in NEMA rerated frames 254U-256U, 284U-286U and 324U-326U.

The motors are housed in heat treated alloys of aluminum. Superior heat transfer characteristics of these alloys make possible an uncluttered frame, it is pointed out, and the aluminum alloy housing also provides lighter weight, increased tensile strength and greater corrosion resistance than usual. Electra Motors, Inc.

51—DOOR BRAKE is simple, highly flexible

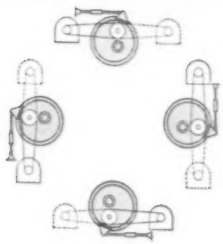
Constructed so that it is flexible, simple and easy to fit into special space requirements, this reciprocating snubber (door brake) consists of a steel tube with a pair of opposing friction-lined surfaces built in, arranged so that one surface is moveable. A polished steel bar passes between friction surfaces. Pressure is applied to moveable surface by means of a flat leaf spring and adjusting screw. According to company, there is no possibility of leakage, yet it performs similarly to a hydraulic device. Friction elements may be made of any practical material, such as Oilite sheets or any standard quality brake lining of any composition. The reciprocating bar may be made of cold rolled steel, stainless steel or any suitable material. Guilbert, Inc.

The FALK all-steel Shaft Mounted Drive

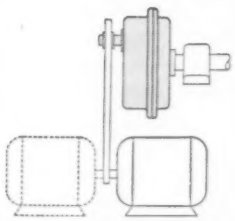
- *Versatile*
- *Efficient*
- *Economical*
- *Compact*

SEVEN SIZES—½ to 50 HP—420 to 5 rpm—single and two double reduction ratios—output torque ratings up to 31,500 lb-in.

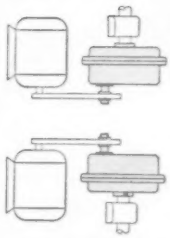
A few of the many ways this reducing unit can be applied—



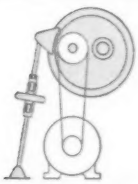
ANY POSITION



MOTOR EXTENDED
—or below the unit



VERTICAL—UP or DOWN



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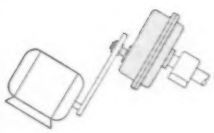
through use of variable-pitch sheaves—automatic belt adjustment with tie-rod adjustment

OVERLOAD RELEASE...
that will slacken belts and cut off power if overload occurs



INCLINED SHAFT...
Any standard unit can be mounted in vertical or inclined position by a simple rearrangement of oil drains

To Plant Engineers:

The versatility of the Falk Shaft Mounted Drive makes it the practical choice for many machines in your plant.

This compact unit mounts on the driven shaft, thereby solving many problems of restricted space. You can obtain almost any output speed between 420 and 5 rpm by selecting the proper single or double reduction unit and the proper sheave or sprocket ratio.

Do you need both horizontal and vertical drives? Standard Falk Shaft Mounted Drives are available for either application; or you can easily convert a horizontal unit to a vertical unit, right in your plant.

Initial cost is low, you get immediate delivery from shelf stock, and installation is quick and easy.

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FALK Shaft Mounted Drives are available from factory and distributor stocks *from coast to coast*. See your Falk Representative or Distributor—or write direct for your copy of **Bulletin 7100.**

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APPLETON V-51 SERIES CONVERTIBLE VAPORTIGHT FIXTURES

Require only seconds

to relamp or convert!

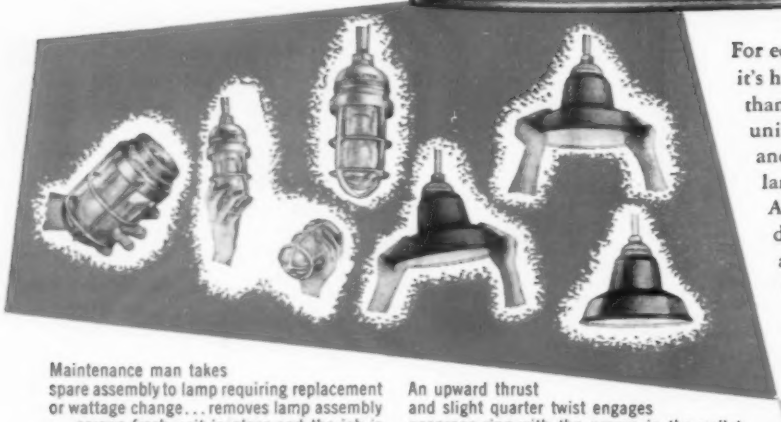
One trip up the ladder, a few quick twists of the wrist, and relamping or wattage conversion is done! V-51 reflectors with integral neoprene ring adapt perfectly to the grooved unilet . . . permit instantaneous substitution of reflectors.

Malleable Iron Unilet Takes either 100 W or 150-200 W adapters. Ceiling, pendent, or bracket types available in a variety of hub sizes.

Reflector Steel, with green porcelain enamel exterior; sized for 100 W, 150 W, or 200 W lamps. Snaps easily into position.

Unit Assembly . . . Adapter, Globe, and Guard 100 W and 150-200 W size globe adapter with shock absorbing socket. Die cast aluminum guard has two sealed stainless steel ball plungers which snap securely into cavities in adapter. Vaportight globe in 100 W or 150-200 W sizes in clear glass or various colors.

U. S. Pat. 2,749,433 2,749,435 2,715,214
Canada Pat. 531,655 511,696



Maintenance man takes spare assembly to lamp requiring replacement or wattage change . . . removes lamp assembly . . . screws fresh unit in place and the job is done! Higher wattages of 150/200 are interchangeable with 100 watt unit and can be used in same unilet body. (Die-cast aluminum guard turns counter clockwise to act as a tool for easy removal in relamping).

An upward thrust and slight quarter twist engages neoprene ring with the groove in the unilet and snaps the reflector in position. Entire operation of removing lamp, inserting new unilet, and positioning of reflector requires no special tools . . . no set screws . . . no small parts to juggle. Absolute simplicity!

For economical service and maintenance, it's hard to find anything more practical than Appleton's V-51 Series exclusive unit assembly (adapter, receptacle, globe, and guard). Shock absorbing socket cuts lamp replacement costs. Try the Appleton V-51 Series standard or shallow dome, deep bowl, or angle type reflectors and 100 W and 150/200 W vaportight unit assemblies in your plant today. Available in a variety of hub sizes in pendent, ceiling, or bracket type fixtures for every kind of installation.

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BULLETINS

(Begins on page 21)

145 Mobile Radio—"Under the Influence of Radio" is a 16-pp guide for prospective users of mobile radio equipment. Includes information on licenses for base stations and mobile units and for drivers. Also gives instructions on adjustments, how to send a message. General Electric Co.

ELECTRICAL

147 Improved TEFC Motors—This company's redesigned line of TEFC tube-type motors with capsule-mounted split-sleeve bearings are described in Bulletin 51B8991. They are available in standard and explosion-proof designs from 40 hp at 600 rpm through 800 hp at 3600 rpm. Bulletin shows the motor's tube-type air-to-air heat exchanger system, bearing construction, frame, stator and rotor construction. Allis-Chalmers Mfg. Co.

148 Fan Motors — Bulletin GEA-6598, illustrated with photos and dimension tabie, describes totally enclosed Tri-Clad 55 air-over motors from 7½ to 100 hp for propeller and axial-flow fans. Smaller and lighter than previous models, motors are shown in cut-away view describing various internal improvements. Included are application information, ratings, dimensions. General Electric Co.

149 Distribution Transformers—Features of company's pole-type distribution transformers are described in 24-pp Bulletin GEA-6070C. Reviews the design and construction of the transformers, covers testing, packaging and service facilities, and outlines research in materials. General Electric Co.

150 Prefab Distribution System — This bulletin describes the Masterguard, a pre-fabricated electrical distribution system. Shows how it performs the three functions of a distribution system: transmission of power, protection, and control. Plug-in devices, service entrance equipment, Uni-Bus centers and control equipment covered. Electric Distribution Products, Inc.

151 Insulated Cable—Properties and characteristics of silicone rubber insulated cables are detailed in 16-pp Form 682-2-58. Discusses individual specifying factors including performance data, service life and physical properties, electrical characteristics, suggested applications. Charts and photos illustrate comparative service life and performance of organic and silicone rubbers within a temperature range of —55 to 200 C. National Electric Products Corp.

152 Switching Reactor — Standard switching reactors for one-step, low-cost static control are covered in 16-pp Catalog S-10. Contains tables of electrical characteristics and several typical application circuits, as well as complete descriptions of the units, their applications, and physical dimensions. Control, Div., Magnetics, Inc.

153 Improved Breakers—Sixteen-pp Bulletin SD-100 describes QO circuit breakers for industrial, commercial, institutional and other applications. Gives detailed information on features of these quick-make, quick-breaker circuit breakers, also covers load centers and panelboards. Tables and specification guides are included. Square D Co.

154 Master Switches — Eight-pp Bulletin 5701A presents design features and engineering data on master switches available in many circuit combinations from one through five speeds, forward or reverse direction. Contains voltage ratings, application photos, contact arrangements and action, prices. Furnas Electric Co.

155 On Transfer Switches — How to select an automatic transfer switch, and applications of this equipment are covered in 24-pp Publication 596-R1. Discusses inrush capacity, continuous duty rating, rapid transferral of load, high thermal capacity and ability to withstand electromagnetic effects, double source control, full phase protection. Automatic Switch Co.

156 Conduit Fittings—Catalog C-58, 28 pp, illustrates conduit fittings and accessories, including new pressure cast EMT connectors and couplings. Provides data on fittings for rigid conduit, for armored cable, flexible metallic tubing and non-metallic cable, and for service entrances. Handy chart shows recommended fittings for wire and cable sizes. Conduit Fittings Corp., Div., U. S. Industries, Inc.

157 Explosion-Proof Batteries — Bulletin IT-526/58 covers design, use and construction of company's line of explosion-proof Slyver-Clad batteries for all applications. Features and advantages are detailed. C & D Batteries, Inc.

158 Steel Battery Racks — Advantages of mounting stationary-type storage batteries on racks are detailed in this 12-pp Bulletin, Form 4883. Tables, photos, line drawings and typical, step-by-step sample problems simplify selection of racks. Exide Industrial Div., The Electric Storage Battery Co.

Reader Service Cards for ordering bulletins are on pages 169-170. Be sure to include your name, job title, and company, even if you want bulletins mailed to your home address.

159 Electrical Insulations—Bulletin GER-1467, 12 pp, presents characteristics and application range of insulating materials which are chemically, physically and electrically compatible. Includes technical data on available products, including mica, mat, varnished cloth and papers, insulating varnishes, wire enamels, Irrathene irradiated polyethylene, sealing and filling compounds. General Electric Co.

160 Insulation Products — Catalog 24 contains 16 pp of information on electrical insulation products, including packaged cuffed coils, hard maple wood wedges, formed fibre wedges and fibre washer assortments. Includes descriptive details, specifications, dimensional data and price tables. Insulation Manufacturers Corp.

161 Power Units—A selenium rectifier a-c to d-c power unit is described in this 10-pp illustrated catalog. Contains complete data and specifications. Syntron Co.

162 Electrical Equipment—Twelve-pp Bulletin 2706 covers, briefiy, this company's electrical products and manufacturing facilities. Emphasis is on variety of equipment available. Condulet electrical equipment, floodlights, other product lines. Installation photos provided. Crouse-Hinds Co.

PUMPS, COMPRESSORS

163 For General Service—Described in Catalog D-100 are pumps for hot and cold water and brine circulation, air conditioning systems, sprinkler systems, boiler feeding, pressure boosting and washing machinery. Cutaway drawings are provided, and mechanical features illustrated. Performance data and sizes are included, as well as specifications. C. H. Wheeler Mfg. Co.

164 Canned Motor Pumps — Features and specifications of company's line of pumps for general process pumping are detailed in Bulletin 1050-3. Included are performance curves for pumps up to 15 hp, dimensions, principles of construction and operation, cutaway views, materials available. Chempump Corp.

165 Hydraulic Pumps, Fluid Motors—Catalog 111 describes company's hydraulic pumps and fluid motors. Gives construction features, performance curves, data on pump-motor combinations, duplex or tandem models and geared flow dividers. Tuthill Pump Co.

166 High Pressure Pumps — Bulletin 1070 describes and illustrates typical pumps available for high pressure fluid handling, as used in high pressure test loop work, radioactive fluid handling and in other services requiring zero leakage pumping in pressurized systems. Performance and engineering data included. Chempump Corp.

167 High Vacuum Vapor Pumps—Featured in 67-pp Bulletin 6-1 is detailed information on performance characteristics of high vacuum vapor pumps and descriptions of the standard models for various high-vacuum requirements. The text is profusely illustrated with photos of typical applications and drawings and diagrams showing operation and design details. Specifications, data tables, dimensional diagrams, pressure curves and temperature and pressure charts supply technical details. Rochester Div., Consolidated Electrodynamics Corp.

168 High Pressure Compressors—Eight-pp Bulletin A-93 provides information on company's heavy-duty high pressure stationary compressors. Includes specifications on four basic high pressure models. Installation photos, sectional drawings and charts deliver complete story on the compressors which are designed for such purposes as soot blowing, chemical processing and gas compression. Joy Mfg. Co.

BULLETINS

(Begins on page 21)

BOILERS, HEAT EXCHANGERS

170 Packaged Boiler — Advantages of company's packaged boiler for capacities from 20 to 200 bhp are detailed in an illustrated 12-pp bulletin. Included are complete data, dimensions and recommended boiler room layouts. Superior Combustion Industries, Inc.

171 Boiler Tube Data — Technical Data Card 157-A lists maximum allowable working pressures, by popular tube sizes, for electric resistance welded boiler tubing. The information is based on the latest edition of the ASME Boiler Construction Code and covers tubing for both water tube and fire tube boilers. The Tubular Products Div., The Babcock & Wilcox Co.

172 Heat Exchanger—Bulletin 302-5K1 describes company's pre-engineered exchanger for handling any combination of liquids and gases, and used as a heater, cooler, condenser or vaporizer. Design and construction details are shown on cutaway diagrams, and dimensional data and specifications are included. Ross Heat Exchanger Div., American-Standard.

173 Heat Exchanger — This 12-pp illustrated bulletin describes the Fin-Pak heat exchanger operable with low-pressure drops under high pressure differentials for gas to gas, gas to air, or gas or air to liquids. Advantages in a wide variety of fuel burning and process equipment applications are detailed. The Air Preheater Corp.

VENTILATING AND AIR CONDITIONING

175 Packaged Cooling Tower—Circular SP-1 contains details on company's Hydra-Glide line of induced-draft, packaged water cooling towers for use with commercial and industrial air conditioning systems. Illustrated with photos and line drawings, includes charts giving specifications, dimensions and performance ratings. Mason Products, Inc.

176 Liquid Cooler — Bulletin HB-258, 16 pp, describes company's package liquid coolers for use in space cooling systems, combination heating and cooling systems and for industrial processes requiring controlled cooling of materials. Design features, typical installations and a detailed description of components are included. Bell & Gossett Co.

177 Air Handling Units—Complete engineering information on company's low pressure sprayed coil and high pressure dry and sprayed coil climate changers is incorporated in 56-pp Bulletin PB-290. Detailed descriptions and illustrations on the all-purpose air conditioners for commercial and industrial comfort and process applications are included. The Trane Co.

178 Vapor Condenser—Bulletin 139 describes company's sectional Aero vapor condenser. Illustrated with photos and diagrams, explains functions of the condenser and provides capacity curves for eight sizes, and a table of dimensions and weights. The machine is designed to condense vapors in a closed system. Niagara Blower Co.

INSTRUMENTS, CONTROLS

179 Receiver Recorder — Sixteen-pp Product Specification E12-5 contains details of plug-in components for company's receiver recorder. In all, twelve types of receivers, controllers, retransmitters, and direct measuring devices, from which recorder may be custom-built, are described and specifications included. Bailey Meter Co.

180 Bellows Flow Meter—Catalog C22-1, 20 pp, covers features, specifications and applications of company's bellows flow meter for flow and liquid level measurement. Two basic models —one for open tank liquid level measurement and the other for closed tank liquid level measurement—are featured. Photos, drawings, charts and dimensional diagrams illustrate text. Minneapolis-Honeywell Regulator Co.

181 Flow Indicators—Bulletin 18W describes flow indicators for pipeline installation, applicable to liquids and gases as well as vapors and slurries sufficiently translucent for observation of indicating components through sight windows. Three types are described. Schutte and Koerting Co.

183 Primary Flow Elements—Heart of this 16-pp folder, Bulletin 100-P5-A, is a table comparing company's metering devices in terms of accuracy, range, life expectancy, initial and operating costs, recovery differential, weight, laying length, to tell at a glance which device is best suited for requirements. Cutaway views and cross-sectional drawings included. Builders-Providence, Inc., Div. B-I-F Industries, Inc.

184 Remote Valve Controls—Bulletin 5811 is a 20-pp design booklet on manual remote valve controls. Provides information on flexible shaft valve controls, including valve couplings and remote operating terminals. Also shown are standard reach rod controls including universal joints, valve couplings, and remote stations. Company's new 300-deg swivel geared joint is also shown. Stow Mfg. Co.

185 Truck Weight Indicator—Bulletin M-8 describes a lift truck weight indicator designed for any hydraulic-cylinder type lift truck. Lists advantages and includes installation and design data. Martin-Decker Corp.

OTHER EQUIPMENT

186 Steel Equipment—Many types of steel shelving, drawers, lockers, work benches and tables and other storage and shop equipment are presented in 48-pp Reference Manual 485. Fully illustrated, catalog provides information on features and applications and includes dimensional data. Also included is price list. Equipto.

187 Copy Process — The Copyflex diazotype reproduction process is described in this 12-pp booklet. Explains various types of direct-positive prints possible. Also tells how use of Copyflex reproducible reproductions (intermediates) can save time, expense and work in engineering, drafting departments. Nine models are described. Charles Bruning Co., Inc.

188 Ultrasonic Cleaning — Bulletin S200, 24 pp, explains practical applications and basic principles of an ultrasonic cleaning method, as well as design of equipment. Advantages and applications are detailed and design considerations covered. Requirements and specifications of ultrasonic generators and transducers are also included. Branson Ultrasonic Corp.

189 Tapes for Planning — Layout tapes for industrial planning use are described in this 16-pp bulletin. Tells how to use these tapes in making a plant layout giving step-by-step procedure. Tapes, grids, templets and charting materials are presented, and prices given. Labelon Tape Co., Inc.

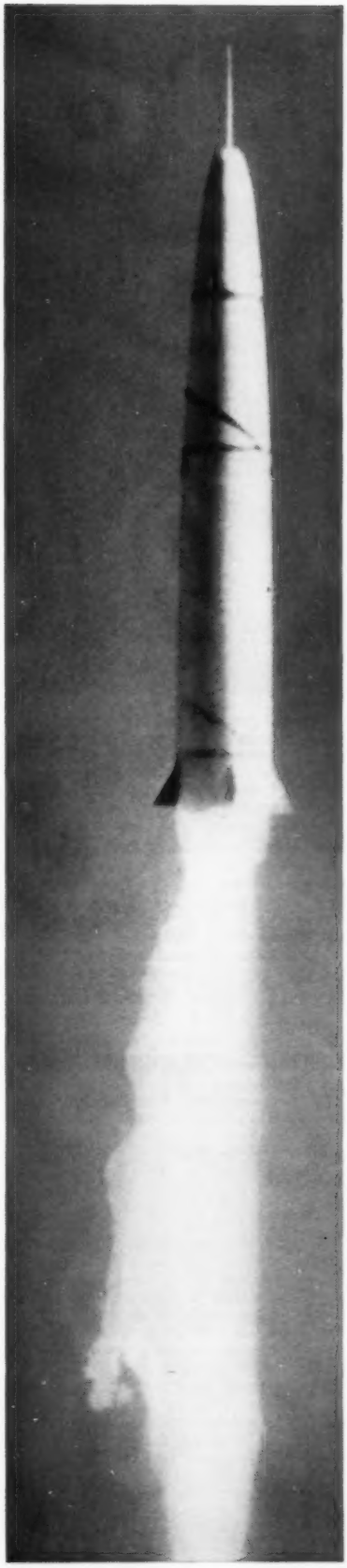
Among New Catalogs Of Special Interest

190 Hydraulic Cylinders—Bulletin JH-104N is a 22-pp practical textbook embracing important aspects of the use of hydraulic power cylinders. Contains complete descriptive information, as well as academic cylinder data, including charts and data on column strength, piston rod deflections, acceleration, factors of safety, cylinder forces, pressure losses in pipes, factors to consider in selection, Miller Fluid Power Div., Flick-Reedy Corp.

191 Industrial Insulations—Thermal, mechanical, physical, and chemical characteristics of company's industrial insulations are presented in 20-pp Catalog J-424. Includes data on high temperature spun-mineral wool insulating block, blankets, pipe coverings and cements and on mineral wool industrial felts and duct insulation. Thermal conductivities and tables of recommended thicknesses of each material are given for appropriate temperature ranges and application instructions are included. Baldwin-Hill Co.

192 Special Fire Protection—Devoted to special hazard fire protection, this 44-pp booklet covers both equipment and methods. Tells how to recognize special fire-hazardous conditions in a plant. Discusses in detail major types of fire protection, telling how each functions, giving its advantages and limitations, and illustrating some examples of successful use. Two features of interest are a discussion of fire itself and a definition of fire-protection terminology and an at-a-glance selector chart. Grinnell Co., Inc.

193 Data on Stainless — Now available is a series of data sheets covering 17 types of stainless steels. An accompanying 8-pp guide indicates corrosion resistance to various chemical media. The data sheets cover chemical composition, typical applications, processing, physical and mechanical properties, machining, forming, welding, and other factors. Jones & Laughlin Steel Corp.



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DATA FILE of literature for the plant engineer's library

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INSTRUMENTS, CONTROLS

301 Overheat Protection—Bulletin MOPRI-1, 8 pp, describes design and operation features of inherent overheat protectors—small devices built into electric motors to turn power off when windings get too hot. Includes photos and wiring diagrams illustrating operation. Metals & Controls Corp.

302 Temperature Controls—Eight-pp Catalog CC, on temperature controls and allied equipment for heating and refrigeration, provides information on recording, indicating non-indicating controls; thermometers; bulb installation accessories. The Partlow Corp.

304 Pressure Gages—In 16-pp Catalog 305 are described gages, with and without integrated switches, used most widely in operation of power and steam plants, refrigeration systems, metal working industries, hydraulic presses, and others where steam, water and non-corrosive oils and gases are principal measured media. Specifications, included. United States Gauge, Div., American Machine and Metals, Inc.

ELECTRICAL

305 Fan-Cooled Motor—Illustrations and description of company's totally enclosed fan-cooled electric motors are featured in Bulletin 827. Cutaway views show internal features. Brook Motor Corp.

307 Electrical Equipment Digest—Electrical equipment illustrated and described in 154-pp Catalog Digest 140, includes load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters, other equipment. Square D Co.

308 Distribution Equipment—Detailed information on company's line of electrical distribution equipment is presented in this 82-pp '58 Marketeer, Catalog M-158. Among equipment described are Electrostrip multi-outlet assemblies, switches, lighting panelboards, power panelboards, switchgear assemblies, and various types of electrical duct. Tables of essential data included. Bulldog Electric Products Co., Div. I-T-E Circuit Breaker Co.

309 Conductor Systems—This 36-pp catalog describes the Insul-8-Bar systems of mobile safety electrification for cranes, monorails and moving machinery. Includes photos and descriptions of typical installations, engineering data, installation procedure, a photo-text list of items that comprise these systems. Insul-8-Corp.

310 Varnished-Cambric Cables—Bulletin VC-56-1OM, 22 pp, covers varnished-cambric cables in a voltage range of 600 to 5000 v for single and three conductor cables braided or lead sheathed. Armored cable constructions in both galvanized steel armor and aluminum armor are shown. Rockbestos Products Corp.

311 Cathodic Protection Cable—Two kinds of cathodic protection cables are described in this informative bulletin. Special advantages of each are listed, and applications and specifications are given. General Cable Corp.

312 For High Voltage Cable—Test results and service records on an improved butyl rubber compound for high-voltage cables are announced in 12-pp Bulletin EB-27. Covers resistance to ozone, operating temperature, high-voltage, dielectric strength, aging, insulating resistance, moisture absorption. Anaconda Wire & Cable Co.

313 Wires and Cables—Interlocked armored cable, supports and fittings designed for low cost, heavy duty industrial, power or control wiring are described in this 24-pp bulletin. Photos and specific descriptions of various types of armored cables available for voltages through 15,000 v, single and multi-conductor are included. National Electric Products Corp.

314 Electrical Wires, Cable—Bulletin 1105, Section 1, 16 pp, features a cable selection chart and complete engineering information on company's line of electrical wire and cable. Advantages of the products are detailed. The Okonite Co.

315 Cable Troughs—This 12-pp catalog offers a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings, horizontal elbows, inside and outside vertical elbows, ties, crosses, covers and many special fastening devices. The Globe Co.

316 Cable Supports—This information folder contains data on company's cable supporting equipment, telling how to install cable supports, as well as giving advantages of cable trough. T. J. Cope Div., Rome Cable Corp.

317 Commutator Maintenance—This commutator and slip ring maintenance data file contains information on methods and procedures for more efficient commutation. Individual bulletins cover brushes, sparking, picking, dragging and other troubles, maintenance tools and how to use them, trouble shooting chart and safety. Ideal Industries, Inc.

318 Fuses for All Uses—This revised edition of manufacturer's complete line, Folder 3, includes illustrations and descriptions of fuses for every purpose. Features dual-element cartridge fuses for time-lag in protection against overloads, and delay renewable fuses and renewal links. Economy Fuse & Mfg. Co.

319 Enclosed Switches—Catalog 83, 28 pp, and Catalog **101**, 20 pp, describe enclosed switches for industrial uses. Included are general switches designed for use on either a-c or d-c applications, sealed switches, heavy-duty limit switches, hand operated switches, and maintained-contact switches. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

320 Hydraulic-Magnetic Breakers—Bulletin 301, 16 pp, describes advantages and operation of company's hydraulic-magnetic circuit breakers. Design and construction features are detailed and time-delay curves, specifications and dimensional data included. Heinemann Electric Co.

322 Protective Equipment Guide—Form SPD is a 24-pp handbook on selection of protective devices for electric circuits, motors, appliances and apparatus, and is based on 1956 National Electrical Code. Besides providing suggestions on how to select right kind of protection, booklet provides wiring diagrams, motor tables, volt loss tables. Bussmann Mfg. Co.

323 Electrical Equipment—Condensed Catalog No. 4 contains 48 pp of descriptive data on company's line of electrical products, including conduit bodies, conduit fittings, connectors, ground fittings and EMT fittings. Dimensional data and features are shown on diagrams, and sizes and prices given. Gedney Electric Co.

324 For Hazardous Locations—Bulletin 2655, 82 pp, featuring Condulets for hazardous locations contains a table listing commercial uses of hazardous substances and their flash points and ignition temperatures. Detailed descriptions of explosion-proof and dust-tight electrical equipment conforming to National Electrical Code are included. Crouse-Hinds Co.

LIGHTING, COMMUNICATION

326 Architectural Floodlighting—Eight-pp Bulletin GEA-6437 illustrates various methods of floodlighting industrial plants, public and commercial buildings and others. Provides information on general purpose heavy-duty floodlights. General Electric Co.

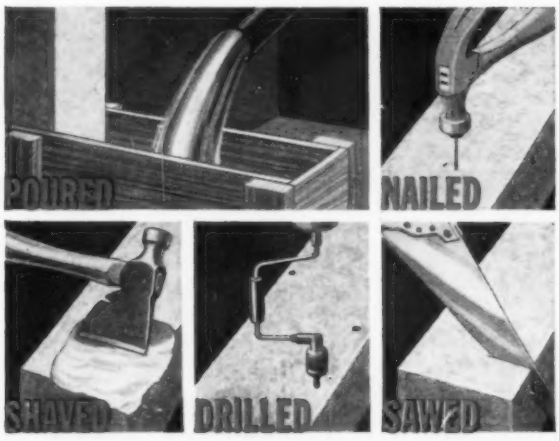
327 Incandescent Lighting—The 24-pp "Incandescent Lighting Guide Book" features sections on the general advantages of incandescent lighting, the history of incandescent lamp developments, and includes chapters on basic types, bulb shapes, sizes, glass types and finishes, and types of bases. Sylvania Electric Products Inc.

328 Illumination Design Data—Basic reference data on interior lighting installations is contained in 48-pp Manual A-4854, which features a section describing footcandle levels required for each group of seeing tasks. These footcandle levels are then related to many kinds of rooms and areas. Westinghouse Electric Corp.

Thermo-Con is widely used for insulated roof decks and cold storage plants in warm climates. This apartment building is in St. Petersburg, Fla. The *Thermo-Con* cellular concrete system is sponsored by Higgins, Inc., New Orleans, La.

VERSATILE IS THE WORD FOR Thermo-Con

Concrete building material made with ALCOA Aluminum Powder saws like wood. Architects, engineers and builders today are talking about the versatility of *Thermo-Con* cellular concrete. Made with cement, water and certain chemicals, one of which is a special aluminum powder produced by ALCOA, *Thermo-Con* utilizes forms and machines designed and patented by Higgins, Inc. The finished material is composed of tiny, uniformly spherical cells that impart a high degree of insulation against heat and cold.



Light in weight yet exceptionally strong, *Thermo-Con* can be sawed or nailed like wood. Users report that it's rot-, dust- and vermin-proof—moisture resistant and sound deadening.

Thermo-Con is prepared as a liquid slurry in a Higgins-designed machine and pumped into forms where it expands to more than twice initial volume. Density and weight may be varied to fit the job.

Higgins tells us that independent laboratory tests have proved *Thermo-Con* superior to commonly used masonry materials in withstanding transverse bending, racking and impact shock. Approved by Underwriters' Laboratories, Inc., classification 8-inch bearing and nonbearing walls—Class B-4.

ALCOA does not make cellular concrete, but ALCOA® Aluminum Powders are widely used in this application. Find out more about cellular concrete and how to use it in building construction. Send the coupon.

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I should appreciate more information about cellular concrete.

Name.....

Company.....

Address.....

City.....Zone.....State.....

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DATA FILE

(Begins on page 174)

329 Lighting Units—Data sheets to be added to Section 30 of company's product catalog are now available. These cover application, construction, installation and wiring of company's lighting units for various duties. Installation and construction details are diagrammed. Day-Brite Lighting, Inc.

330 Signal Equipment—Tips on how to select suitable signals for any specific operations are offered in Bulletin 100. Describes horns, bells, warning lights, other signal equipment. Specifications, photos, wiring diagrams, dimensions, audibility rating charts, electrical characteristics and other data included. Federal Sign & Signal Corp.

HEATING AND COOLING

331 On Unit Heaters—Latest improvements, specifications and performance data for Herman Nelson horizontal and vertical unit heaters are covered in 36-pp Bulletin 700A. Includes complete hot water and steam performance tables, dimensions, selections, applications. American Air Filter Co., Inc.

332 Warm Air Space Heater—Eight-pp Bulletin 552 describes features and advantages of company's warm air space heater designed to serve a variety of industrial and commercial needs. Typical installations are pictured, installation method described, other data furnished. Dravo Corp.

333 Plumbing, Heating Supplies—Edition H is the current edition of this company's 126-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and illustrated, the catalog gives detailed information on sizes, intended uses. J. A. Sexauer Mfg. Co., Inc.

334 Stainless Steel Heaters — Complete description and specifications on stainless steel direct-fired heaters are included in 6-pp Bulletin F-57A-RO. Cutaway views, drawings and diagrams illustrating design and construction features are included. Reznor Mfg. Co.

335 Cabinet Heaters—Sixteen-pp Bulletin 1306 describes and illustrates cabinet heaters equally suitable for steam or hot water applications. Capacity tables, dimensional drawings, and suggested arrangements are given for each model. Also included are sample fan specifications, sound ratings, and other data. Ilg Electric Ventilating Co.

336 Industrial Heaters—Advantages and features of a line of industrial heaters for space heating, drying, make-up air and oven applications are detailed in this illustrated bulletin. A cutaway view points out essential design features, and tables of dimensional data and engineering data are included. Lennox Industries, Inc.

337 Heat Exchanger—Bulletin 132 describes company's sectional heat exchanger which offers a completely self-contained system independent of any considerable water supply. Diagram explaining functions and installation photos included. Niagara Blower Co.

INSULATION, PROTECTION

338 Piping Insulation — Seven-pp Bulletin SO 1054 features a snap-on, one-piece molded pipe insulation of fine glass fibers for hot or cold piping. Specifications are given for industrial, commercial, and institutional piping. Gustin-Bacon Mfg. Co.

339 Insulation Coating—This 32-pp illustrated handbook, Form L-17, presents the advantages of company's No-Drip insulation coating for preventing condensation drip from metal, concrete, brick, wood, plaster or composition surfaces. Lists applications and describes methods of applying. Contains tabulated data on quantities required. J. W. Mortell Co.

340 For Insulation Protection—Provided in this comprehensive looseleaf manual is technical information covering practically every requirement for insulation protection. An aid to proper adaptation and application of mastics, flashing compounds, adhesives and surface coatings, this book presents information classified as to industry usage, as power, process, cold storage. Book is available to qualified plant engineers. Benjamin Foster Co.

VALVES, TRAPS, FITTINGS

342 Valve Performance Facts—Included in this 36-pp booklet are 32 case histories of cost-saving valve installations. Service applications covered include steam, oil, water, coating fluid, chlorine, phenol, pulp stock, vacuum, others. Crane Co.

343 Industrial Valves—Bulletin 507V illustrates and describes company's line of industrial valves for control of air, gas, liquids and solids. Features photos and descriptive detail on a variety of valves, including butterfly valves, wafer butterfly valves, slide valves, others. W. S. Rockwell Co.

344 Bronze Valves—Described and illustrated in this bulletin are 150-lb WSP bronze, globe, angle and check valves. Bulletin contains service ratings, dimensional drawings for each type of valve and an exploded view of a globe valve with matching text for each component. Walworth Co.

345 Valve Lubrication—This 19-by-24-in. chart contains maintenance and lubrication information for company's lubricated plug valves. Of heavy paper with metal edges, the chart features detailed exploded views of four types of valves and includes a table of recommended lubricants for oil, water, gas and chemical service. Meter and Valve Div., Rockwell Mfg. Co.

346 Corrosion-Resistant Valves — Eight-pp Bulletin 7 contains complete engineering specifications for company's corrosion-resistant valves, as well as photos of individual types in the line. Alloy Steel Products Co.

347 Silent Check Valves—Bulletins WH-654, WH-754, and Bulletins 856 feature descriptive and engineering data on company's line of silent check valves for a variety of applications. The bulletins cover center guided, globe type, and a silent gas-air check valve. The Williams Gauge Co., Inc.

348 Hydraulic Control Valves—Catalog 200-7, 16 pp, describes construction features and advantages of company's line of hydraulic control valves. Photos, dimensional diagrams, circuit wiring diagrams and data included. Logansport Machine Co., Inc.

349 Valve Comparison Chart — Form 194R-1, 22 pp, is a valve camparison chart listing valve figure numbers of 15 major manufacturers and the OIC equivalent valve figure numbers. Compares variety of valves in ferrous and nonferrous materials, describes valve liners. The Ohio Injector Co.

350 Steam Trap Book—Catalog J. 44 pp, serves as a manual on trapping practices. Includes a catalog section giving physical data and prices on cast semi-steel, and forged steel inverted bucket steam traps, compound steam traps, and ball float air and air relief traps. Handbook section tells how to calculate condensate loads, and select traps for each class of equipment, and a maintenance section covers trap installation, trouble-shooting and repair. Armstrong Machine Works.

351 Impulse Steam Traps—Bulletin T-1742, 8 pp, describes how the impulse steam trap works and includes complete details on pressures and temperatures, materials, capacities, weights and dimensions. Photos illustrate some installations. Yarnall-Waring Co.

352 Bellows Design Guide—Twenty-pp Catalog 155 contains helpful information on applications, design considerations, and standards for metallic bellows. Details on using bellows manufactured from various metals are included. Flexonics Corp.

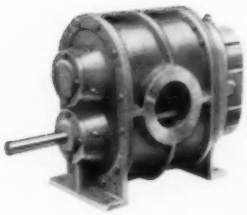
353 Quick Coupler—Eight-pp Catalog F-10-R gives complete information on Kamlok quick couplers, used on hoses, piping, and equipment. Describes features, applications, materials, styles and sizes. Contains dimensional drawings, pressure-temperature ratings, and useful chemical service recommendation chart. Jordan Industrial Sales Div., OPW Corp.

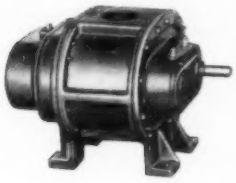
354 Air Devices—Circular 587 describes the complete line of air devices, specifically designed to eliminate costly air leaks. Dimensions, pressure requirements and complete descriptive information on each device are included. The Lunkenheimer Co.

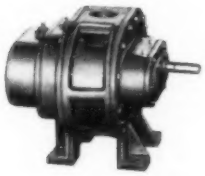
355 Corrosion Resistant Coupling—Bulletin 270 contains pertinent facts on a quick connect, quick disconnect coupling for acids, alkali, solvents, high pressure steam and other fluid transfer lines. Cutaway view shows design features. Snap-tite, Inc.

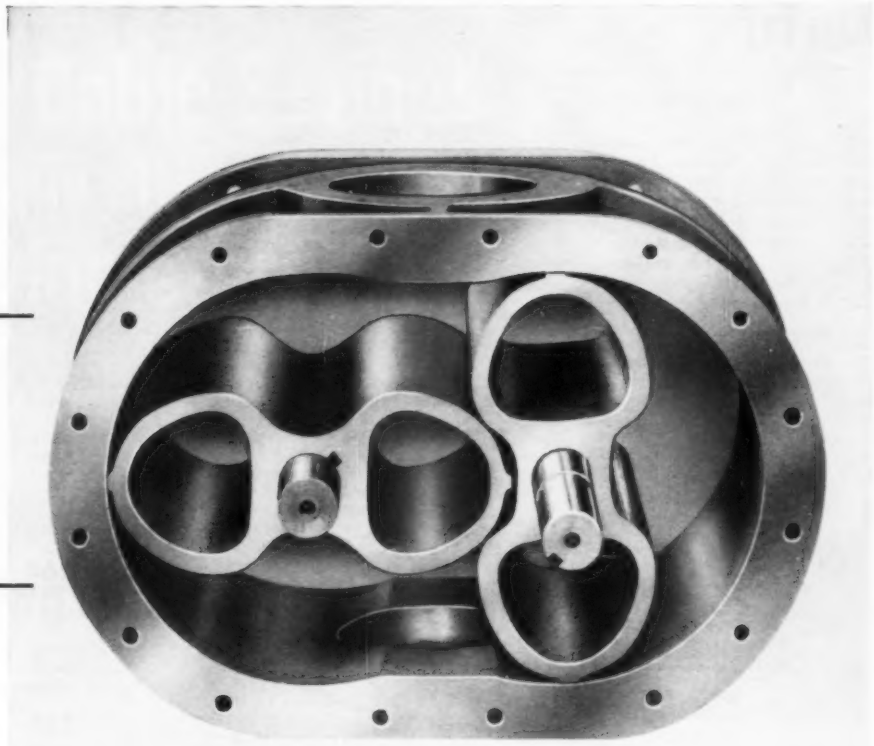
PACKINGS, SEALS

356 Teflon Products—Three bulletins present this company's Teflon packings, gaskets, special parts and stock. Bulletin CP552 describes Chem-









Sutorbilt blowers deliver air or gas at capacities up to 20,000 cubic feet per minute and pressures or vacuums up to 10 pounds. Design incorporates two figure-eight impellers which rotate in opposite direction and deliver a metered volume of air or gas.

SUTORBILT BLOWERS ASSURE TOP PERFORMANCE AND DEPENDABILITY

You want peak performance . . . from a blower that needs no special attention. Sutorbilt *ruggedness* gives it to you! Cases, headplates and impellers are of sound, close-grained cast iron. Heavy-duty anti-friction bearings maintain factory clearances throughout long service life. Wide-face herringbone gears, —run in a bath of oil—are engineered to absorb heavy shocks without affecting precise timing of impellers.

These and other Sutorbilt design features —plus highest-quality manufacturing methods—assure maximum, maintenance-free service from Sutorbilt blowers and gas pumps. Write for illustrated brochure giving complete specifications.

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ROTARY POSITIVE-PRESSURE BLOWERS AND GAS PUMPS WITH VERTICAL OR HORIZONTAL MOUNTING

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1163
S-10

DATA FILE

(Begins on page 174)

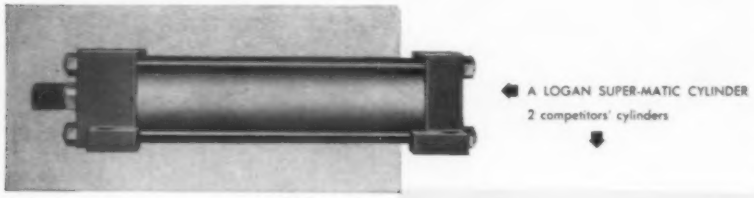
pro lines of Teflon ring packing, Teflon impregnated asbestos packing, V-type packing and Teflon seal cage—for use with acids and strong chemicals. Bulletin CP553 covers Teflon jacket gaskets, solid ring gaskets, expansion joints and special gaskets. Bulletin CP554 illustrates special parts. Chemical & Power Products, Inc.

357 Braided Packing—Form AD-131, 8pp, describes lattice braid packings designed for longer service life and lower maintenance. A table of general recommendations gives essential data, and a table of lengths and weights is included. The Garlock Packing Co.

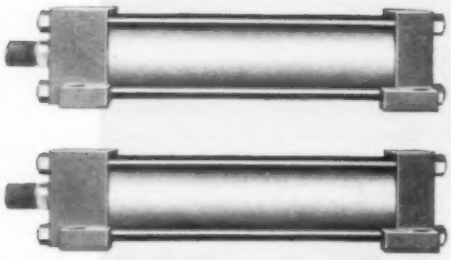
PUMPS, COMPRESSORS

359 Multi-Stage Pumps—Catalog B-100 describes company's line of vertically split case, multi-stage pumps. Design and construction features are described and performance curves and metallurgical data given. Economy Pump Div., C. H. Wheeler Mfg. Co.

360 Pump Data — Application and capacity data on company's line of pumps, including centrifugal pumps, screw pumps, reciprocating pumps, and rotex pumps, are presented in this product bulletin. Photos of each of the models, along with descriptive detail, are included. Warren Pumps, Inc.



do they LOOK ALIKE?
...sure they do on the surface...



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Logan Super-Matic Cylinders
are made to interchange with other leading manufacturers' cylinders . . .

1 Logan designs assure the service required for those extra-rugged applications.
2 Over FORTY YEARS of cylinder manufacturing know-how.
3 Built by CRAFTSMEN whose average service record with LOGAN is more than 20 years.
4 Manufactured in a plant which applies the most modern production methods.

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☐ 200-1 HYD. POWER UNITS
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☐ 200-3 750 SERIES HYD. CYLINDERS
☐ 200-4 AND 200-7 HYD. VALVES
☐ 200-6 SUPER-MATIC CYLS.
☐ 300-1 CHUCKS
☐ ABC BOOKLET
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361 Horizontal Compressors—Eight-pp Bulletin HAC-40 describes company's Class RX horizontal, single-stage air compressors. Keyed cutaway illustrations show design and construction features. Lubrication, controls available and standard equipment are covered. Gardner-Denver Co.

362 Air Compression for Industry—This is a 24-pp combination data book and catalog on all types of air compressors from ⅓ hp to 20 hp. Discusses factors to be considered in the use of air for each operation, and points out importance of determining how much usuable air is needed. The Wayne Pump Co.

363 Industrial Compressors—Bulletin SSB-56 covers company's complete line of industrial air compressors from the ½ hp to 150 hp, including the accessories that go to make a complete installation. Photos of the various models are included, as well as specifications and dimensions. Schramm, Inc.

364 High Pressure Compressors—Bulletin A-93, 8 pp, describes company's high pressure compressors for soot blowing, chemical processing, gas compression and other high pressure needs. A cutaway view illustrates component features. Joy Mfg. Co.

365 Compressor Data — Feather valve compressors from 75 to 350 hp are described in 32-pp Bulletin L-676-B1A. Advantages of installation, operation and maintenance costs are outlined for types YC and DYC compressors. Information and illustrations are offered on component parts, including frame. Worthington Corp.

MAINTENANCE

366 Basic-Roofing Information—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of good re-roofing job. Johns-Manville.

367 Handbook on Coatings — This 1958 Coating Manual is a 32-pp treatise highlighting the stopping and preventing of rust on nearly all types of rustable metal. Book contains information and recommendations to enable determination of specific coatings needed. Basic principle of Rust-Oleum's fish oil penetration into pores of metal is illustrated. Application photos give new ideas for protecting girders, tanks, boilers, roofs. Contains 100 color chips. Rust-Oleum Corp.

368 Light Scaffolds — This series of illustrated bulletins describes company's line of aluminum alloy Up-Right scaffolds and accessories. Pictures one-piece sections and multi-section models with various ranges of adjustability. Points out safety features. Up-Right Scaffolds Div., Up-Right, Inc.

SLINGS, CHAINS, WIRE ROPE

369 Wire Rope Manual — "Inspection of Wire Rope," "Methods of Lu-

Control Cable Savings Begin with Small Diameters

For New Work or Rewiring...

SPECIFY & BUY
ROCKBESTOS
PNR
600 VOLT CONTROL CABLE

PNR — Polyethylene • Nylon • Rockhide (PVC)

HERE'S THE PROOF WHEN IT COMES TO CONDUIT FILL

No. 12 A.W.G. (19/25)		1 CABLE PER CONDUIT				2 CABLES PER CONDUIT				3 CABLES PER CONDUIT				4 CABLES PER CONDUIT			
		Max. Cable Dia."	Number of Conductors in one Cable			Max. Cable Dia."	Number of Conductors in one Cable			Max. Cable Dia."	Number of Conductors in one Cable			Max. Cable Dia."	Number of Conductors in one Cable		
COND. SIZE-		Table 11 N.E.C.	ROCK PNR	3/64"	4/64"	Table 11 N.E.C.	ROCK PNR	3/64"	4/64"	Table 11 N.E.C.	ROCK PNR	3/64"	4/64"	Table 11 N.E.C.	ROCK PNR	3/64"	4/64"
½"	New Work	.450	2-4			.243				.234				.195			
	Rewiring	.479	2-4			.276				.252				.218			
¾"	New Work	.598	5-7	2-3		.323				.311				.260			
	Rewiring	.636	5-8	2-4	2	.367				.335				.280			
1"	New Work	.762	8-14	4-7	2-4	.412	2-3			.396	2			.333			
	Rewiring	.811	9-16	5-8	3-5	.468	2-4			.427	2-3			.360			
1¼"	New Work	1.000	15-19	8-12	5-8	.543	4-5	2-3		.523	3-5	2-3		.440			
	Rewiring	1.070	17-19	9-16	6-9	.618	5-8	2-4		.564	4-5	2-3		.475			
1½"	New Work	1.170		13-19	9-12	.634	6-8	4	2	.610	6-7	4		.513			
	Rewiring	1.248			10-14	.721	8-11	5-7	2-4	.658	6-9	4-5	2	.555			

This is an excerpt from the Rockbestos Control Cable Conduit Fill Chart covering sizes A. W. G. 9, 12, 14. Write today for your free copy. Ask for PNR 1-58.

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PNR
Small Diameter Control Cable

MORE THAN 16,000,000 FEET IN SERVICE

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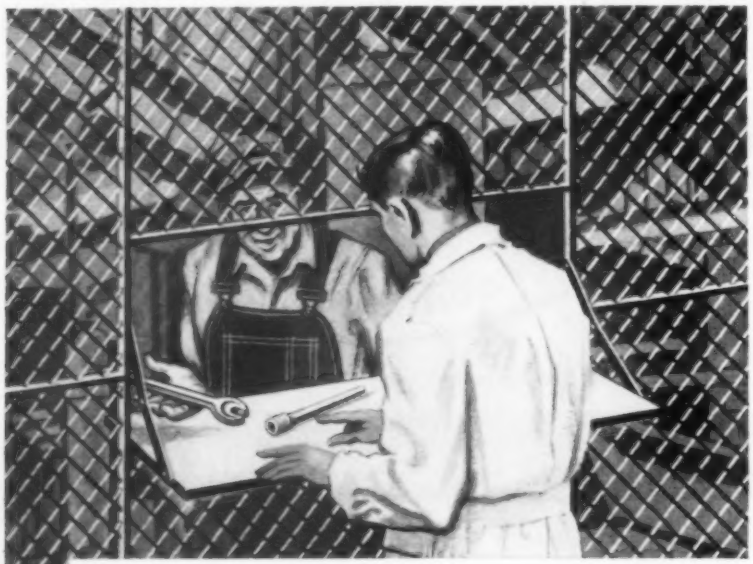
DATA FILE

(Begins on page 174)

bricating Wire Rope," "Use and Abuse of Wire Rope," and "Sheave Maintenance" are among subjects covered in this 188-pp Wire Rope Manual, Catalog G-16. In addition, there are sections devoted to strengths and weights of wire rope, cable assemblies, and rated capacity of slings. Manual is available to qualified plant engineers, please state your job title when requesting it. Macwhyte Co.

370 **Drop Forged Fittings**—Comprehensive data on company's line of drop forged fittings for wire rope and chain are presented in 40-pp Catalog 950-2. Includes specifications, dimensions, rated capacities and weights. Also announces range of sizes and capacities in many of items listed, as well as new products, including wire rope clips, chain links, clevis links, weldless sling and end links, swivels, shackles, hooks, others. Crosby-Laughlin Div., American Hoist and Derrick Co.

371 **Sling Chain Handbook**—Illustrated Data Book 100, 32 pp, presents "how to do it" information on sling chains—from ordering to care, use and inspection. Contains diagrams, charts and tables on standard and special styles of sling chains and attachments. Columbus McKinnon Chain Corp.



REDUCE THEFT LOSSES!

Do you know that employee theft of company-owned tools, supplies, etc. totals more than 200 million dollars per year? That's right! . . . and *your* company is paying a portion of that "bill". That's why you'll find low-cost Phoenix wire mesh partitions one of the best investments you can make. For simply by erecting Phoenix partitioning around your tool rooms, store rooms and other such areas, you will *substantially* decrease the "mysterious disappearance" factor that even now is costing your company untold sums of money. And your savings in reduced theft losses will, *in fact*, pay for your Phoenix partitioning many times over. Want more details? Write today for the new Phoenix bulletin on Wire Mesh Partitions. It's yours for the asking!

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PHOENIX WIRE WORKS, INC.

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372 **Sling Handbook**—The 64-pp Tuffy Sling Handbook is replete with illustrations, charts and diagrams describing 16 factory fitted slings and nearly two dozen standard fittings available for slings, including several which are recent additions to the line. Book contains a complete rigger's manual, shop chart of ratings, an engineer's notebook and standard signals for directing operations of overhead traveling cranes. Union Wire Rope Corp.

373 **Wire Rope Cost Control**—The Service-Score System for controlling wire rope costs is the subject of this illustrated folder. Described is an easy method of fact-finding to increase wire rope operating efficiency and help reduce supply and maintenance costs. Sample set service-score stickers are included. Leschen Wire Rope Div., H. K. Porter Co., Inc.

CONSTRUCTION

375 **Aluminum Building Products**—Form AD 285 is a 32-pp catalog covering company's line of aluminum industrial building products. Cites advantages of aluminum, pictures some installations. Installation data, weights, dimensions and roughing-in details are provided on corrugated roofing and siding, V-beam roofing and siding, ribbed siding sheet, perforated corrugated sheet, flat flashing sheet. Aluminum Co. of America.

376 **Building Panels, Panes**—Form SL-3, 8 pp, presents Structoglas A reinforced plastic corrugated building panels and flat panes, giving information on product's mechanical and physical properties, chemical resistance, colors and finishes. Installation instructions cover sidewall mounting, roof construction. Skylight construction and continuous windows are shown. Structoglas Div., International Molded Plastics, Inc.

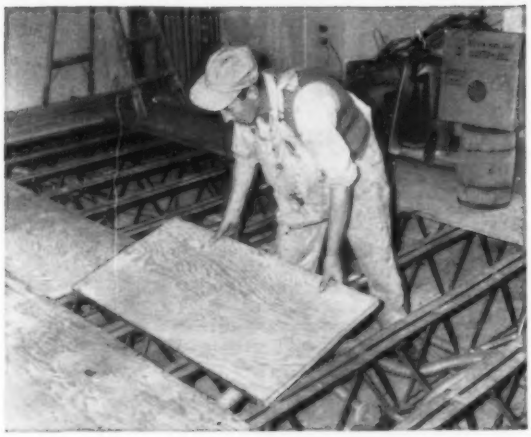
377 **Panel Wall Construction**—The advantages of company's M-Type Q-Panel walls are outlined in 12-pp Bulletin Q35-55. Includes installation photos, diagrams, specifications, as well as drawings pointing out structural details. H. H. Robertson Co.

378 **Fir Plywood**—This 34-pp construction guide contains full-page structural drawings providing basic information on types, grades, and applications of fir plywood. Booklet covers information on floor construction, single and double wall construction. Douglas Fir Plywood Association.

379 **Structural Clay Products** — Illustrated in color, 24-pp Catalog S-58 details characteristics and applications of structural clay products. Various types of facing tile and brick for interior and exterior walls, as well as floors, are shown. Natco Corp.

380 **Plastic Panels**—Glass fiber reinforced plastic panels for skylighting and sidewall lighting are illustrated and described in this information bulletin. Advantages are detailed and panel specifications tabulated. Rippolite Plastic Products, Inc.

381 **Functional Glass** — Advantages of company's rolled, figured and wired



STRONG

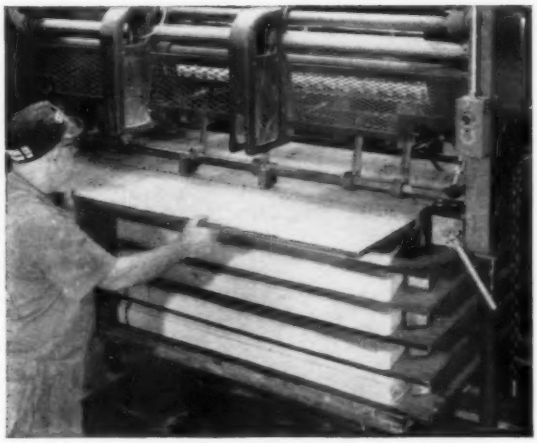
Plywood flooring system boosts load limit in office building

A special flooring system, using stout 1⅛" thick plywood over steel joists helped solve a heavy loading problem encountered when Pacific Telephone and Telegraph Co. decided to mount a battery of huge IBM data processing machines in an older building. Conventional load limits in most office buildings is about 70 lbs. psf. The new plywood floor and specially designed joists boosted the live load rating to the required 200 psf, and permits a concentrated load of up to 1,000 lbs. per machine leg to be transmitted to the floor on large rubber casters resting on steel plates.

DURABLE

Overlaid plywood fume exhaust ducts outlast metal

Switch from metal to overlaid plywood for exhaust manifolds at this giant cellophane plant has sharply reduced maintenance and replacement costs. Installed over four years ago, the ducts have shown no sign of deterioration under continued exposure to sulphuric acid mist, carbon bisulphide, water vapor and other chemical fumes. High density overlaid plywood was used for the manifolds. It has hard, glossy, fused phenolic resin surfaces that are highly resistant to acids and other chemicals. It is virtually impervious to vapor and requires no paint or other protection.



LOW COST

Plywood pallet trays halve labor and storage costs

Fir plywood off-bearing pallet trays in this operation at Myercord Company in Chicago, permit one man to do the work of two and cut storage space in half. The big one-piece pallets are used for storing and handling decals. They're strong, splitproof and light in weight. Previously the company used ¾-inch lumber mounted on 2 x 6 skids with pipe legs to take the weight of individual loads. The bulkier lumber pallets required an additional man at the off-bearing end of the press and consumed twice as much storage space as the new and simple fir plywood pallets.

FIR PLYWOOD

DFPA® TESTED QUALITY

Letters DFPA on panel back or edge attest manufacture and inspection under industry-wide quality control program. Individual grade-trademarks are specification guides to the right type and grade and the *right* quality.

FOR INFORMATION about specific plywood uses, or for basic specification-use data, write (USA only) Douglas Fir Plywood Association, Dept. 180, Tacoma 2, Washington.

For more facts circle 611 on Reply Card

DATA FILE

(Begins on page 174)

glass for vertical sidewall and skylight glazing are detailed in Catalog 58-G, 20 pp. Describes types suited for commercial, institutional, industrial applications. Provides transmission data, light distribution properties, photos of patterns. Mississippi Glass Co.

382 Foundation Pipe Piles—Comprehensive information on Taylor Forge spiral-weld foundation pipe piles is presented in a 24-pp, Form F-5677. In addition to detailed specifications, the illustrated booklet describes a number of pipe-pile installations and includes driving logs. L. B. Foster Co.

383 Wire Partitions — The modern, economical approach to plant layout problems is described and illustrated in 8-pp Bulletin P-55 on wire partitions and custom enclosures. Describes important design and construction features, and includes specification data and dimensional diagrams. Wire and Iron Products Inc.

384 Steel Floor Plate—Skid resistance and other advantages of USS multigrip rolled steel floor plate are stressed in this illustrated bulletin. Also gives dimensions, data on allowable loads. United States Steel Corp.

385 Grating and Treads—Bulletin 2527 is a 26-pp, illustrated bulletin on grating and treads for a variety of applications. Presents descriptions of electro-forged, riveted, rectangular, diagonal, U-Type and T interlocked grating and treads. Tables of safe loads and information on specifying are also included, as well as photos of typical applications. Blaw-Knox Co.

386 Non-Slip Flooring — Algrip, an abrasive rolled steel floor plate described as non-slip even on steel inclines, is the subject of Booklet AL-29, 8 pp. Discusses safety features, fabricating. Alan Wood Steel Co.

387 Construction Service — Twelve-pp Manual CS-5256 covers the scope, qualifications and benefits of company's construction service, a specialized service for those who want to buy any product installed. Includes descriptions and photos of types of work. Armco Drainage & Metal Products, Inc.

STORAGE, SHOP EQUIPMENT

388 Guide to Shelving — To assist plant engineers in selecting proper shelving for all storage requirements, 64-pp Catalog 30 offers detailed suggestions for correct shelving for storing materials, loose and packed parts, record files. Shop equipment and storage cabinets are also described, and instructions included for planning and construction of stockrooms. Deluxe Metal Furniture Co.

389 Shop Equipment — Work benches, tool stands, shelving and other pressed steel equipment for the shop, laboratory and assembly line are shown in 8-pp Form 2299. Construction features and specifications of size, top material, equipment variations given. Standard Pressed Steel Co.

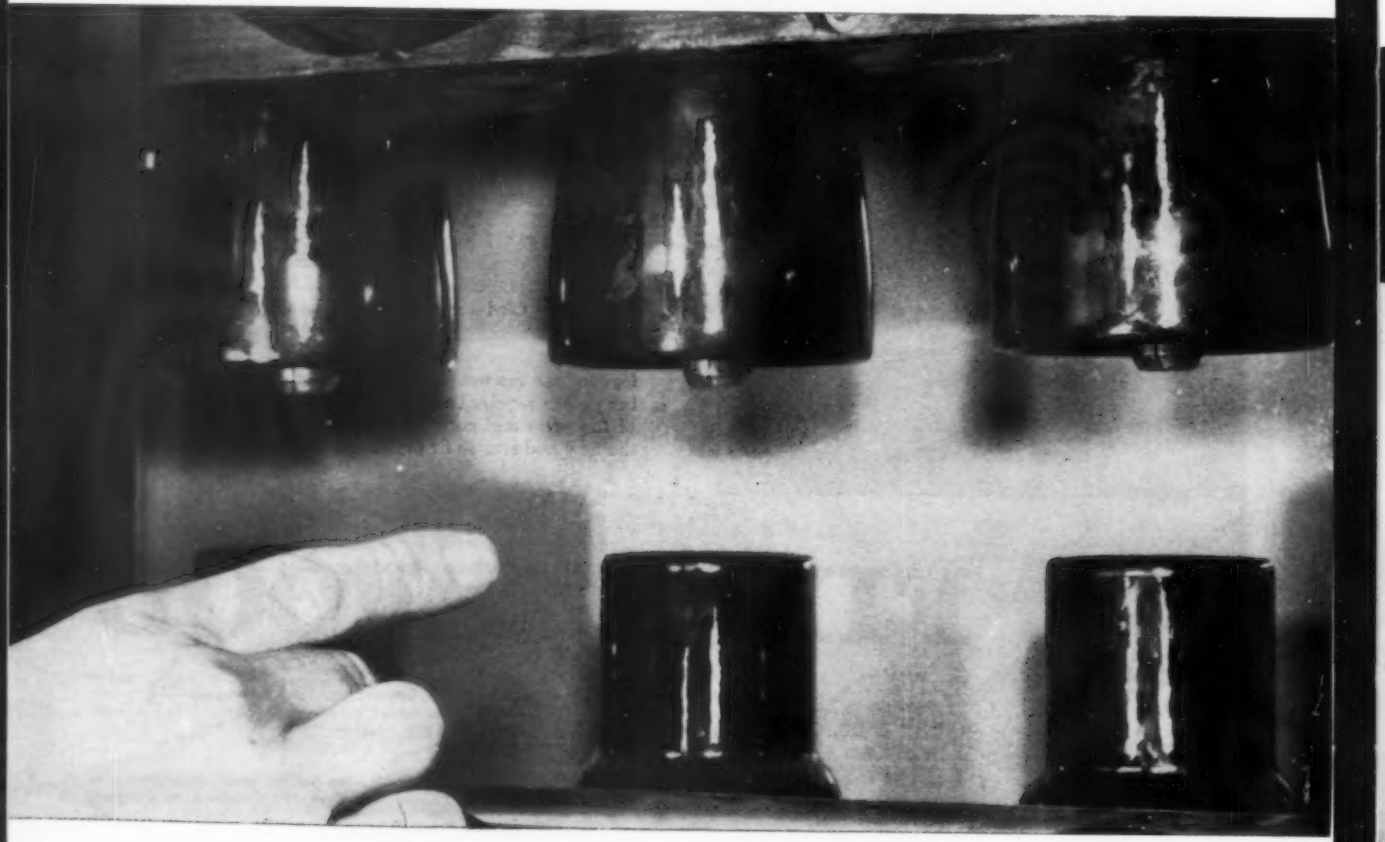
MECHANICAL POWER TRANSMISSION

391 Magnetic Drives—Data on design, drive features, opening and performance, curves, output torque rating-dimensions, selection chart, as well as photos of installations and applications are included in 6-pp Bulletin W-T 1-57. Whitney Chain Co.

392 Shaft Mounted Drives—Bulletin 7100, 32 pp, describes all-steel, helical gear, shaft mounted drives for applications in the range from ½ to 50 hp and from 420 to 5 rpm output speed. Covers unit design and construction and provides suggestions on using the drives. Also given is information on how to select proper size and ratio of unit, sheave and belt. The Falk Corp.

393 Multiple Drive Systems — Advantages of company's multiple drive system which provides simultaneous speed changes are detailed in Form F-1910. Examples of basic applications included. U. S. Electrical Motors Inc.

394 What's In a V-Belt?—Informative little 16-pp Booklet S-51105 describes raw materials used in producing V-belts. Natural and synthetic rubbers, cotton and synthetic cords, rubber chemicals and steel cables used in company's line are subjects for explanations of each material's role in the final product. Goodyear Tire & Rubber Co.



395 Self-Aligning Coupling — Principles and features of company's all-steel gear-type self-aligning coupling are detailed in Form 273-M50. A cutaway view illustrates important features and a table gives coupling ratings and dimensions. Koppers Co., Inc.

396 Dihederal Spindle Couplings—Catalog 64, 12 pp, covers the development, production and application of company's dihederal spindle couplings for roller drives. Cross-section drawings and dimensional data are given on sizes and types of spindle couplings. Ajax Flexible Coupling Co., Inc.

397 Flexible Couplings—Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings for power transmission. Tells advantages of these couplings and discusses design principles. Double-flexing and floating shaft types, light duty couplings and types. Thomas Flexible Coupling Co.

398 Cylindrical Roller Bearings — Multi-Row cylindrical roll neck bearings are described in 24-pp Form 436. Contains complete engineering and technical data on cylindrical roller bearings designed for heavy-duty service in roll neck mountings on hot and cold rolling mills. SKF Industries, Inc.

399 Mill Bearings—Eight-pp Book 2665 describes company's line of mill bearings with heavy duty, self-aligning roller bearings and steel housings. Dimensional data and diagrams are provided. Link-Belt Co.

LUBRICATION

400 Mineral Oils—Properties and applications of company's mineral oils especially compounded to reduce leakage are detailed in Data Sheet 23. Advantages of using these oils in hydraulic units explained. Sun Oil Co.

401 Lithium Greases—This product information bulletin presents manufacturer's six Litholine industrial greases, stressing industry advantages offered by these multi-purpose greases. Gives properties of the greases, general application and performance characteristics. Sinclair Refining Co.

402 Fundamentals of Wear — Vol. 42, No. 12 of this company's publication, "Lubrication," provides a 12-pp article on function of lubricants in reduction of wear and friction. Deals with phenomena associated with sliding, basic wear processes, interpretation of lube performance. The Texas Co.

TOOLS, MACHINE SHOP

404 Portable Electric Tools—This standard catalog, Form 10, 24-pp, features portable electric tools, including electric drills, bench-drill stands, hole saws, buffing and polishing kits, sanders, polishers, grinders, hammers, etc. The Black & Decker Mfg. Co.

405 Industrial Tools — Information on a complete line of industrial tools, including 500 new types and sizes never before offered, is presented in 120-pp Catalog 57. Included are complete lines of wrenches, socket wrenches, drop forged clamps, tool holders, set up and hold down tools, cutting tools and pipe tools. Photos, drawings and numerous charts aid selection. Armstrong Bros. Tool Co.

406 On Electrode Selection—How to select proper electrode for any welding job is covered in 12-pp Weldirectory Bulletin 7000.1. Describes basic characteristics of each family of electrodes, including deposition, arc action, amount of slag, bead appearance. Differentiates between individual electrodes. The Lincoln Electric Co.

407 Industrial Wrenches, Hand Tools—Tools for production lines, maintenance work and product servicing are featured in a 156-pp Industrial Catalog 58-1. Loaded with pictures and tool facts, book describes in detail the complete line of over 4,000 tools—including chests and roll-cabs, wrenches and sockets of all types, screwdrivers, pliers, pullers, electric impact wrenches, etc. Snap-on Tools Corp.

408 Pipe Tools—Ordering and application information on Ridgid pipe tools is provided in 16-pp illustrated Catalog 7596R6. Wrenches, cutters, threaders, reamers, vises, and others are pictured and described, also power drives, pipe and bolt threading machines, oilers. The Ridge Tool Co.

409 Data for the Shop—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44 pp. A section on metal working fluids covers their function and selection, preparation and

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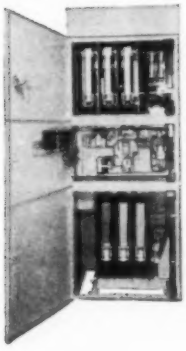

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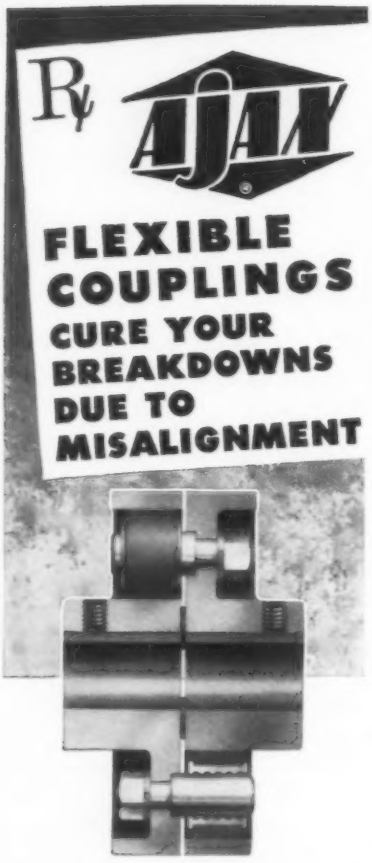

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DATA FILE

(Begins on page 174)

use of soluble oils and paste compounds, and prevention of dermatitis. A section on metal working facts gives conversion tables, steel numbering systems, machinability ratings of metals. Standard Oil Co. (Ind.)

410 **Special Blast Cleaning**—Photos and schematic drawings are used in 34-pp Catalog 105-D to show how airless blast cleaning, air blast cleaning and wet blast cleaning has been employed in specific applications. Short case histories relate the experiences of more than 50 companies in solving special cleaning problems. Wheelabrator Corp.

FILTERS

411 **Intake Filters**—Eight-pp Bulletin 100 describes a line of intake filters for internal combustion engines, compressors, blowers, motors and generators. Standard, silencer and ground level installation models are covered, and tables of sizes, and selection chart are included. Dollinger Corp.

412 **Filters, Strainers**—Industrial Catalog 1058, 48 pp, provides application and engineering information on company's line of micro-filters and precision strainers. Fuel filters, full flow and by-pass lube filters, dry type air filters, air separators, and metal edge strainers for fuel lube and industrial use shown. Purolator Products, Inc.

MATERIALS HANDLING

414 **For Overhead Handling**—Booklet 2008-M, 12-pp, is replete with illustrative material on principal components of overhead handling systems. Track design and advantages of supporting it flexibly are described, and formulas and figures for comparing various track systems are included. Subjects covered include carriers. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

415 **Overhead Handling Systems**—This 8-pp catalog pictures and describes a line of overhead handling equipment and details advantages of overhead handling systems for various industrial operations. Typical applications are pictured and described. The American Monorail Co.

416 **Overhead Cranes** — Bulletin HD-1000, 12 pp, contains detailed information on heavy double girder overhead cranes designed to serve a variety of industrial handling needs. Photos of typical installations are included. Industrial Crane & Hoist, Ingersoll Products Div. Borg-Warner Corp.

417 **Overhead Cranes** — Twenty-pp illustrated Bulletin 900 describes standard overhead traveling cranes, including double girder and single girder types in both top-running and underhung designs. Motor-driven and handgeared models are cataloged in capacities from 1000 to 20,000 lb. Full specifications are given, including spans, clearance dimensions. Hoist & Crane Div., Robbins & Myers, Inc.

418 **Crane System**—Twenty-pp Bulletin TRC-101 describes advantages and applications of company's Trak-Rak crane system and features typical installations in auto body handling, bar stock storage, container storage, pipe storage, pallet and skid storage, skid box storage, tote pan storage, small parts storage, others. Engineering data and dimensional diagrams are included. Chicago Tramrail Corp.

419 **Self-Dumping Hoppers**—Bulletin 255 describes self-dumping hoppers reported to cut cost of hand unloading at least 50 per cent. Details rugged construction of the units, safety catch incorporated, other features. Standard models are pictured, as are some typical jobs handled. Roura Iron Works.

420 **Vertical Transportation**—Selection of vertical transportation for every traffic-moving job is detailed in 32-pp Bulletin A-382. Various types of elevators and escalators for a variety of commercial and industrial applications are described and dimensional diagrams illustrating arrangements included. Recommended sizes and capacities are listed. Otis Elevator Co.

421 **Chain Hoists**—Catalog 61, 20-pp, describes construction and design features of company's multiple gear chain hoists, with a large cutaway view showing component parts included. A table of dimensions is given, as well as dimensional diagrams, shipping information. Reading Crane & Hoist Corp.

422 **Electric Hoists** — Twelve-pp Bulletin DH 133B describes Speedway electric hoists of 500- to 4000-lb capacities. Fully illustrates and explains design features and gives details on suspensions and conducting systems. Clearance data included. Wright Hoist Div., American Chain & Cable Co., Inc.

423 **Special Purpose Trucks**—Catalog 104, 36 pp, describes features and applications of special purpose hand trucks. Along with illustrations of the various trucks in the line, it lists advantages of design and construction and gives full specifications. Rol-Away Truck Mfg. Co., Inc.

424 **Cost-Cutting Materials Handling**—"The How Book of Cost-Cutting Materials Handling," is a 24-pp booklet covering various phases of the materials handling problem and their effect on industrial production. Text and pictures cover such subjects as fundamental handling motions, advantages of planned material handling practices, analysis of handling organization. The Yale & Towne Mfg. Co.

425 **Steel Conveyor Belts** — "A profitable approach to the selection of steel processing conveyor belts" is the subject of this 16-pp bulletin. Simplified selection, standard specifications, and installation information are included. The Colorado Fuel and Iron Corp.

427 **Dragline Conveyors**—Catalog 157, 48 pp, describes Towveyors (chain-in-floor) and overhead tow conveyors for towing carts around warehouses, other areas. Contains engineering information, dimensions and cross-sections of component parts, installation data of assistance to those making their

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DATA FILE

(Begins on page 174)

own installations, layouts and pictures of systems. Jervis B. Webb Co.

428 Conveying Equipment—Catalog 856 illustrates and describes company's line of conveyor systems, including roller wheel, belt, live roller, chain, overhead trolley, and elevating conveyors; sheet metal and roller spirals, portable power conveyors, ball transfers, special conveying machinery, and spring mounted roller conveyors. Photos of various installations tell the story. Mathews Conveyer Co.

429 Automatic Bulk Handling—Bulletin 530, 32 pp, on Airstream conveyors, presents information showing how pneumatic conveying has solved many bulk handling problems. System diagrams of typical installations point out applications and flexibility of conveyors. Over 70 illustrations show how air transports granular or powdered material. Dracco Div., Fuller Co.

430 Casters and Wheels—This 192-pp manual, Number 60, contains detailed information on a line of casters and wheels designed for a variety of furniture and equipment applications. Dimensional data, specifications and price lists are provided for furniture and industrial casters and wheels, and photos, drawings and diagrams illustrating design and construction features are included. Darnell Corp.

WATER TREATING

432 Products and Services—Bulletin GSP-901, 24 pp, describes products and services of this company and its various divisions. These include ring balance instruments, components for control systems, electronic devices, force measuring devices, water and steam treatment, testing equipment. Hagan Chemicals & Controls, Inc.

433 Cooling System Treatment—Bulletin C1 describes advantages of company's treatment for cooling tower systems with synergised polyphosphates. Details of the cooling system treatment are fully covered. National Aluminate Corp.

434 De-Ionization Processes—Various types of de-ionization processes and equipment are featured in Bulletin B-157. Covers mixed bed de-ionization, twin-bed de-ionization, industrial softeners, filters of various types, aerators for gas removal, clarifiers for flocculation, standard package units, power package for boilers and process water. Illinois Water Treatment Co.

FANS, VENTILATING

435 Ventilation Units—Bulletin FM-315, 25 pp, describes basic construction of company's package propeller fans for commercial and industrial applications. Illustrated case histories of typical installations are included. Buffalo Forge Co.

436 Industrial Fans—Bulletin 702A features company's line of fan equipment for industrial air and material

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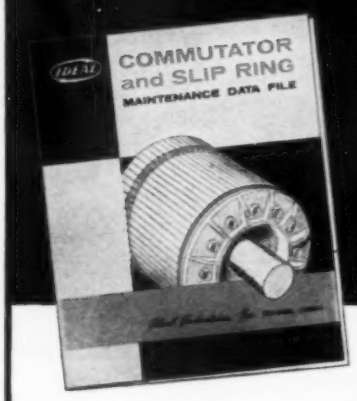

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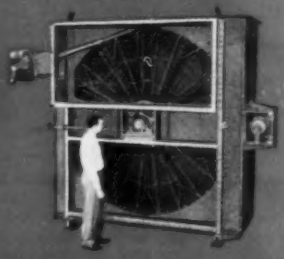

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DATA FILE

(Begins on page 174)

handling applications. Photos illustrate various types available, and complete descriptive detail and a table of general data are included. Clarage Fan Co.

437 PVC Blowers and Fans—Advantages of unplasticized rigid polyvinyl chloride blowers and fans for exhausting corrosive air, fumes and gases are detailed in this illustrated bulletin. Physical properties of polyvinyl chloride are tabulated. Industrial Plastic Fabricators Inc.

438 Industrial Fans — Propellair Bulletin 650, 12pp, contains dimensions, application, and performance data on Tubeaxial and Stackbooster fans. Gives information on cooling and drying problems, system and open surface tank ventilation. Robbins & Myers, Inc.

Postage-free Reader Service Cards make it easy to order catalogs. Cards are provided on pages 169 and 170.

439 Air Engineering—Bulletin E-57 is a 24-pp air engineering data file covering engineering and test facilities for propeller fans, specifications, construction, maintenance, and installation. Tables for estimating air-handling requirements, entrance and elbow losses and duct sizes are provided. Aerovent Fan Co., Inc.

440 Fans and Blowers — Bulletin A-108, 16 pp, contains installation, operation and maintenance information on fans and blowers for many applications. Typical centrifugal blower performance is plotted on curve, and other engineering data such as designation of rotation and discharge, motor data, terms and definitions, rectangular equivalents of round ducts, entrance losses. Hartzell Propeller Fan Co.

DUST CONTROL

441 For Dust Collection—A collection of product sheets providing application suggestions and specifications on Dustkop equipment designed to solve a wide range of dust handling problems is provided in the Series 700 bulletins. Various models are described and illustrated. Aget Mfg. Co.

442 Hydro-Filter—Bulletin 556 describes outstanding features of company's hydro-filter for industrial dust collection. Cutaway view shows construction and design details. Dimensions and a table of capacities included. National Dust Collector Corp.

OTHER EQUIPMENT

443 Insect Control—Featuring manufacturer's insecticides and insect control equipment, this practical 36-pp booklet provides excellent tips on the control of industrial insects. More than 60 pests are pictured along with specific information on where they are found, identifying features, extent of

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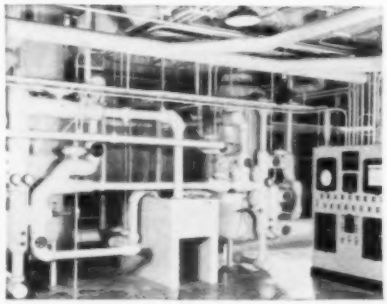

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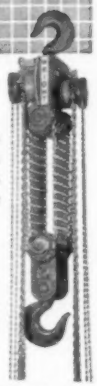

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Bulletin 412A gives complete details on the many outstanding features that make Wright Safeways your best buy for long, trouble-free life. Write York, Pa. for your copy.

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Load and Idler Sheaves rotate on life-lubricated, antifriction bearings...minimum of 5 pockets in Big Sheaves for efficiency and long life.

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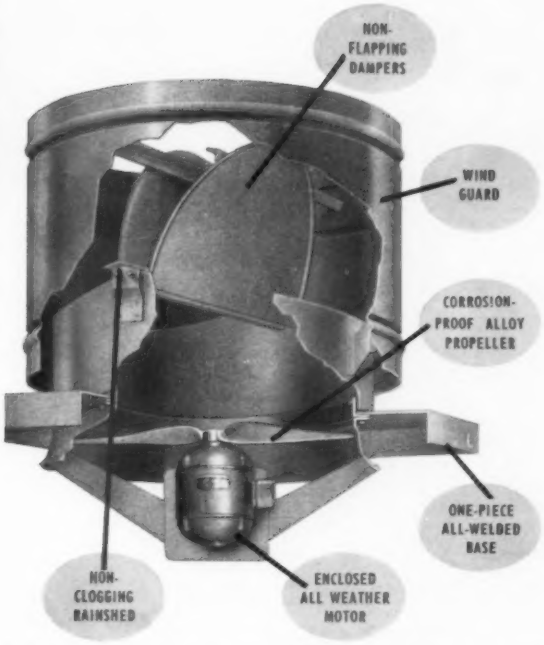

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POWER ROOF VENTILATORS ELIMINATE MAINTENANCE

Sky-Blast weatherproof design is strictly functional and maintenance-free! This powerful industrial ventilator helps preserve roofs too, by shooting heat, fumes and oily mist high into air so they can't turn downward!

All-welded base of heavy gage steel is hot-dip galvanized *after fabrication* . . . has no seams that can open up or rust through. Fully enclosed weatherized R&M motor is completely protected against rust and corrosion. Rigid one-piece cast aluminum magnesium alloy airfoil propeller operates continuously without failure from bending fatigue. Reinforced damper blades won't stick . . . feature self-lubricating bronze bearings. Patented non-clogging rainshed design eliminates troublesome conventional drain trough. Deep inner throat drains condensate onto roof, not into building.

Sizes from 16" to 60" for 2820 to 78,800 CFM—PFMA Certified Ratings. Available with new patented Smoke-Trip® thermally actuated emergency damper release for fire protection.

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MOVING AIR IS OUR BUSINESS®

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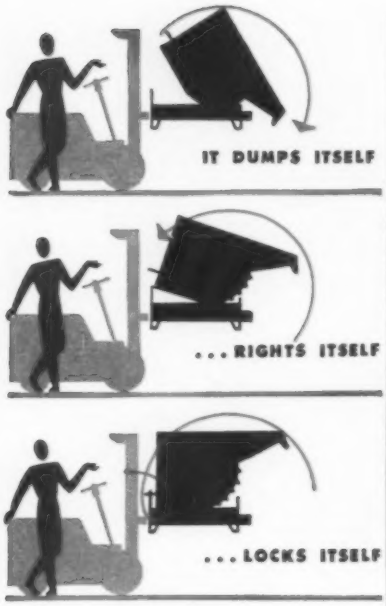

This hopper and your truck can cut handling costs 50%

It's a self-dumping hopper made for fast, efficient handling of wet or dry, hot or cold bulk materials, such as:

Scrap Metal . . . Cinders
Cullet . . . Hot Forgings
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Hundreds of industries use thousands of them. Pick-up is swift and simple. Forks or platform of any standard lift truck slide easily into hopper underframe. Truck operator picks up loaded hopper . . . transports it to its destination . . . trips the latch . . . and the Roura does the rest . . . automatically.

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Standard models are available for immediate shipment from stock.

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Self-Dumping
HOPPER

WANT MORE DETAILS on how you can save money with Roura? Just clip this coupon . . . attach it to your letterhead . . . sign your name . . . and mail to

ROURA IRON WORKS, INC.
1413 Woodland Ave., Detroit 11, Michigan

For more facts circle 623 on Reply Card

DATA FILE

(Begins on page 174)

damage, life stages and cycles, characteristics of existence, and recommended control measures. Ten insecticides detailed. West Disinfecting Co.

444 Brinemaking Manual — Details on modern brine-making methods and equipment are presented in 12-pp Manual 135. Three types of brinemakers are described, as well as a wet salt storage system, and cutaway views are included. Morton Salt Co.

445 Blending System—The Airmerge system, a means of blending pulverized materials in a silo through quadrant aeration, is introduced in Bulletin B-1. Discusses a typical installation, development of the Airmerge, and principles of blending. An isometric drawing shows how dry materials are homogenized by combining quadrant blending and pulsated aeration. Fuller Co.

446 Permanent Plate Magnet—Bulletin 1071, 8 pp, contains comparative performance charts and graphs showing how to select exact type and size of plate magnet for a particular installation. Complete specifications and other information included. Stearns Magnetic Products.

447 Packaged Automatic Boiler—Six-pp Bulletin 1241 describes company's packaged automatic boilers for both air atomizing and pressure atomizing, for oil burning and for gas. Covers operating features and includes chart listing ratings, dimensions, weights. Orr & Sembower, Inc.

448 Industrial Stack — Detailed information on a permanent, low cost refractory smoke stack for commercial and industrial applications is contained in 8-pp Bulletin IS-32. Gives product information, applications with boilers, furnaces and incinerators. Van-Packer Co., Div., The Flintkote Co.

449 Draft Starter—Capacity data for Quickdraft units are presented in 8-pp Form QF-SD. Seven capacity tables provide means for determining capacity of standard units when installed under hundreds of different conditions. An insert pictures and describes installations. Quickdraft Co.

450 Synthetic Rubber—Applications and characteristics of Viton—a fluorocarbon elastomer—are illustrated and discussed in 8-pp Elastomer Notebook Section 81. Photos showing the material in applications are included. E. I. du Pont Nemours & Co. Inc.

451 On Super Refractories — Properties and applications of super refractories are detailed in this 22-pp catalog. Principal characteristics and fields of applications for silicon carbide refractories, electric furnace mullite refractories, fused aluminum oxide refractories, fused cast alumina refractories, high temperature insulating refractories and castable cements are covered. Chart listing typical chemical analyses included. The Carborundum Co.

This Yarway team has scored high—over a million installed on all types of steam equipment. Stocked and sold by 270 Industrial Distributors. For free Steam Trap Book, write YARNALL-WARING CO., 145 Mermaid Ave., Philadelphia 18, Pa.

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KOR...the Economical Short Cut to better combustion:

1 Completely dissolves sludge in the tank and the entire fuel system . . . keeps sludge suspended in solution with the oil.

2 KOR increases rate of combustion, cuts fuel costs because it makes all the combustibles go to work.

3 Eliminates manual cleaning because KOR keeps entire fuel system clean.

SAFE, EASY TO USE, COMPLETELY ALKALINE!

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A get offers more! Over 38 standard Dustkop models to choose from . . . *Plus* engineering service to help you select, provide, and install the proper accessories and fittings to complete your dust collecting system. Write for illustrated folder . . . Today!

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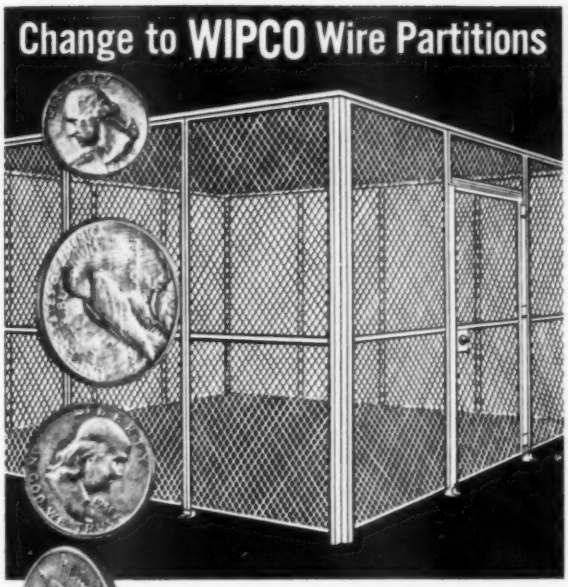
Change to WIPCO Wire Partitions



. . . and keep the Change!

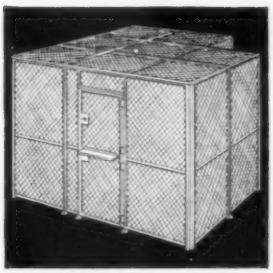
For low-cost installation, maximum flexibility and minimum maintenance, WIPCO wire partitions are your best bet! They provide a rigid wall which permits the passage of light and vision—allows full circulation of air for heating and ventilating. Easy and economical to erect, your own men can put them up!

WIPCO partitions have no rough edges to invite corrosion, snare clothing or cut hands. They're easy to paint and clean—promote better "house-keeping." When your plans call for partitions or enclosures*, specify WIPCO for lower costs and increased efficiency!

WRITE FOR BULLETIN P-55!

WIRE PARTITIONS AND ENCLOSURES FOR

- Stock Rooms
- Tool Rooms
- Departmental Divisions
- Experimental Rooms
- Corridors
- Locker Rooms
- Cashier's Cages
- Plant Protection Booths
- Many Other Uses



**Standard* partitions are available from stock. *Custom-built* enclosures (shown above) can be made in any size for any requirement!

WIRE AND IRON PRODUCTS INC.
1731 Sixteenth Street • Detroit 16, Michigan

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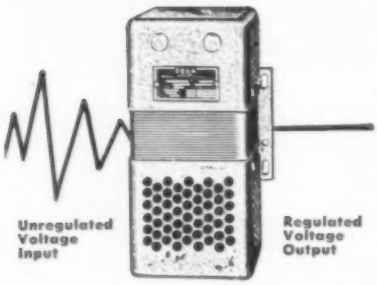
End your line voltage variation troubles



If you are plagued with excessive line voltage fluctuation, a Sola Constant Voltage Transformer can "smooth out" most of your power problems as quickly as it takes to install one of these dependable units. It's a simple and inexpensive method of voltage stabilization that can save you time and dollars.

These compact, reliable units provide voltage output regulated within ±1% with line voltage fluctuations as great as ±15%. Regulation is automatic and continuous. They are self-protecting against short circuits on output or load circuit.

Your maintenance man can install a Sola Constant Voltage Transformer in little time. He has no adjustments to make. There are no tubes, no moving or renewable parts. Once installed, these stabilizers need no further attention.

Guard against lighting failures

For mercury lamps . . . outages due to line voltage fluctuations can be avoided by using Sola Constant Wattage Mercury Lamp Transformers. *For fluorescent lamps* . . . Sola Constant Wattage Fluorescent Ballasts will provide positive lamp starting.

These fluorescent and mercury lamp ballasts operate lamps at full rated light output, regardless of line voltage fluctuations. They provide cool, dependable, ballast performance.

For full information write for literature

Sola Electric Co., 4633 W. 16th St., Chicago 50, Ill.

SOLA

Constant Voltage Transformers
Regulated DC Power Supplies
Mercury Lamp Transformers
Fluorescent Lamp Ballasts

For more facts circle 628 on Reply Card

DATA FILE

(Begins on page 174)

452 Preheating Combustion Air — This well-illustrated 36-pp booklet explains fuel savings and increased performance made possible by using waste heat in flue gases to preheat incoming combustion air. Also covers increased boiler output, ability to use lower grade fuels. Air Preheater Corp.

453 Water-Cooled Stoker — Design and operating advantages of the Vibragrate Stoker are outlined in this illustrated bulletin. A large cutaway view details component parts of the stoker. American Engineering Co.

454 Standard Storage Tanks — The broad scope of services to which company's standard storage tanks are put is covered in this 20-pp catalog. Such qualities as versatility and economy are stressed and typical installations are pictured. Engineering standards given. Graver Tank & Mfg. Co., Inc.

455 Boiler Tube Expanders—Bulletin Y-46, 16 pp, describes three general types of boiler tube expanders and includes detailed specifications to assist in selection. Along with the specification tables, the bulletin includes photos, drawings. Lagonda Div., Elliott Co.

456 Industrial Hose — Bulletin IH-10 features application and selection data on industrial hose, including braided, horizontal braided, wire braided, wrapped and braided, wire woven, smooth bore and rough bore. Descriptions of each type of hose are followed with application information and dimensional data. Table of chemical recommendations is also provided. The Gates Rubber Co.

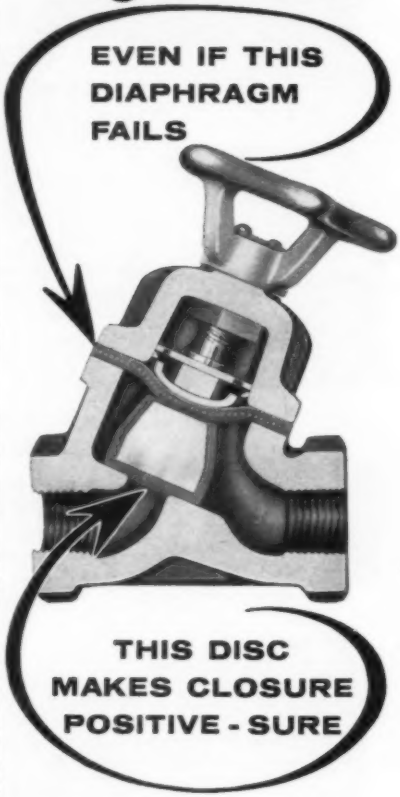
457 Phenolic Plastics — A primary evaluation of the properties of company's phenolics and the combinations in which they are available, in thermosetting molding materials and industrial and coating resins, is featured in this illustrated bulletin. Properties and applications indicated. Durez Plastics Div., Hooker Chemical Corp.

458 Industrial Finishing Equipment —Catalog A-657, 12 pp, describes a complete modern finishing system for cleaning, rust proofing, drying, painting and finish baking operations. The R. C. Mahon Co.

459 Protective Clothing — Catalog 12000, 12 pp, describes and illustrates company's line of industrial clothing for protection against water, fire, acids and alkalis, slipping and scuffing. Various types of work gloves and suits and coats are featured. The B. F. Goodrich Co.

460 Clad Plate — This 32-pp brochure describes manufacture of Hortonclad, a composite metal produced by a flux-free high strength bonding process which provides an integral and continuous bond between an alloy or special metal and its backing plate. Lists a variety of available cladding and backing metals. Also outlines research, design, fabrication and erection facilities. Chicago Bridge & Iron Co.

CLOSES TIGHT *regardless*



With Rockwell "D-D" Diaphragm Valves, you don't depend on the diaphragm to seal and shut-off fluid flow. This is done by the tight seating disc which will always close even should the diaphragm rupture in corrosive, abrasive, vacuum or other service.

The diaphragm serves a single purpose: to seal the valve's operating mechanism. It can be replaced without removing the valve from the line.

Rockwell "D-D" Valves provide other advantages: low closing torque; low pressure drop; high capacity; minimum maintenance. Available with lined and unlined bodies; flanged, threaded or with union ends. Get Bulletin 800.

***You're SURE - You're SAFE with* ROCKWELL "D-D" VALVES**

W. S. ROCKWELL COMPANY
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FAIRFIELD, CONN.

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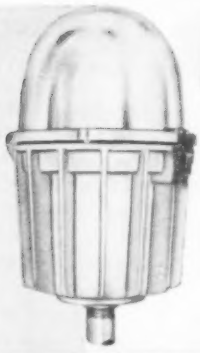

Newest and Finest

Industrial Beacon Ray Warning Light

Where you need a warning you need the best warning

The adaptability and success of the model 275 Beacon Ray created demand for an even more powerful and more rugged warning light. The new Beacon Ray Model 271 more than doubles the intensity and range of prior designs. It can mount on a 1" pipe or on a flat surface. It has a substantial cast aluminum housing and a heat resistant glass dome which houses a mechanism that rotates a single, powerful sealed-beam spot lamp. The hinged cover with single clasp, facilitates relamping and inspection. The Model 271 Beacon Ray is built for real service and full dependability! The only revolving warning light with adjustable tilt-beam feature. Write for bulletin on new Beacon Ray Model 271 light today.

FEDERAL SIGN and SIGNAL Corporation

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CASTERS AND WHEELS

efficient
economical

provide the quality features you need!

RUBBER TREADS . . . a wide choice of treads suited to all types of floors, including Darnelloprene oil, water and chemical-resistant treads, make Darnell Casters and Wheels highly adapted to rough usage.

RUST-PROOFED . . . by zinc plating, Darnell Casters give longer, care-free life wherever water, steam and corroding chemicals are freely used.

LUBRICATION . . . all swivel and wheel bearings are factory packed with a high quality grease that "stands up" under attack by heat and water. Zerk fittings are provided for quick grease-gun lubrication.

STRING GUARDS . . . Even though string and ravelings may wind around the hub, these string guards insure easy rolling at all times.

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two holes in the sky . . .

cool water for air conditioning

Two 16' 4-blade "AL-Metal" Propellers, ***efficiency-engineered*** to this application, keep working temperatures uniform in a large midwestern office building. By the people who designed and developed the famous "Macheta" Airfoil Propeller — acclaimed as ***industry's most efficient air-moving surface!***

Photo courtesy Watercooling Equipment Co., St. Louis

Write for free Bulletin 510.

Aerovent

FAN COMPANY, INC.

ASH and BOND STS. • PIQUA, OHIO
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BROOK

the motors you can install and forget!

Because they're no ordinary motors—stators, rotors, windings, electrical varnishes, and bearings used are designed and selected to give you long, trouble-free service under the toughest conditions. Yet, BROOK MOTORS cost no more than ordinary motors —*usually cost less!* No wonder BROOK MOTORS are praised so highly throughout industry. NEMA Rerate (Open Drip Proof Shown) and Standard Frame Motors, 1 to 600 horsepower, available from warehouse stocks in principal cities. *Send for the cost-cutting facts today!*

SINCE 1904

world's most respected motor

BROOK MOTOR CORPORATION

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BROOK MOTOR CORPORATION

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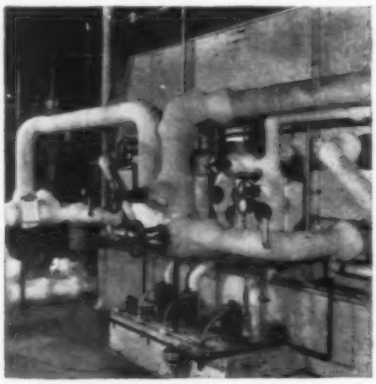
...a machine with "A GOOD RECORD as a REVENUE PRODUCER"



A typical case of using a Niagara Aero Heat Exchanger to provide cooling for production equipment shows amortization of this machine in 16 months and $90 per day revenue thereafter.

Industrial engineers with careful cost, upkeep and revenue records on all machines, credit Niagara Aero Heat Exchangers with important gains over other methods.

They use these machines to provide cooling for production equipment, welders, extruders, drawing dies, furnaces, quench baths, plating, chemical and electronic process...all millwater system uses.

They get positive control of critical process temperatures with improved product quality, rejection losses prevented. Heat is removed at the rate of in-put.

A closed system, dirt free prevents all troubles from bad water; transferring heat to the atmosphere by the evaporation of a very small amount of water solves all problems of water supply or disposal.

Write for Bulletins 120, 135

NIAGARA BLOWER COMPANY

Dept. PE-7, 405 Lexington Ave., New York 17, N.Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

For more facts circle 634 on Reply Card

Controlling Costs on Plant Orders

(Continued from page 89)

before notification. We have found that the last 25 per cent of the work on most jobs can be analyzed better while the job is still in process. This allows sufficient time to correct any difficulties before the job is over-run, and to obtain advance approvals for additional funds.

It may appear that this form has no effect on controlling the cost of plant orders and that it is only an instrument to obtain more funds before a job is over-run. However, under this system we have observed that the trades supervisors invariably follow the jobs very closely from start to finish, in order to avoid explaining abnormal charges when the job is reviewed by the engineers.

Our experience with this system has more than justified the time and effort required to set up and maintain the controls. **End**

Study Humanizes Safety

(Continued from page 96)

no objections) are light safety glasses of the non-restricting type.

High voltage-radiation: Some large Klystron tubes emit X-rays. Eimac, cognizant of the problem (since damage, though unfelt, can be cumulative), employs a full time "radiation health physicist." Maintenance constructed lead shields for the tubes. One type is a round "silo," its walls of 3/16-in. lead sheeting mounted on steel frames. Another type is a flat shield, equipped with thick lead-glass windows, and set in place with an overhead crane. Additionally, engineers wear lead-glass goggles (for eye protection) and film badges and dosimeters to check on radiation dosage.

High voltage interlock: Voltage, a second problem in the high voltage direct-current lab, is safety-controlled through an interlock system of 35 keys. All 35 must be inserted in their test-console locks before the 240,000 volts of d-c power at 2 amps can become operative. To enter a high voltage area, engineer removes a key—effectively de-powering the area until he's out of harm's way.

Results surprised even Eimac. Frequency rates plummeted from 15.94 in 1953 (the program's second year) to a far-below-industry-average of 2.28 in 1956. During 1957's first six months, the company experienced no time-loss accidents at all . . . its rate an amazing 0.00. **End**

Permanently End Condensation Drip, Rust and Corrosion with NoDrip Plastic Coating!

Here is the inexpensive, easy way to solve your condensation problem once and for all. NoDrip plastic coating acts immediately to insulate and protect tanks, pipes, walls, ceilings, air ducts and other metal equipment against condensation drip, rust and corrosion. NoDrip can be applied by anyone without special experience with brush, trowel or spray. NoDrip is also resistant to acid, alkali and brine... protects concrete, brick, plaster, tile, wood or composition surfaces.

FREE

32-PAGE NoDrip DATA HANDBOOK — Complete with photographs, charts and technical information to help solve your condensation problem. Write today!

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J. W. MORTELL COMPANY, 597 Burch St., Kankakee, Ill.

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The SNAP Makes the Difference

IN THIS AIR TRAP

NO COSTLY AIR LEAKS WITH THE

ARMSTRONG SNAP-ACTION TRAP

The spring-powered valve snaps wide open for fast drainage, snaps tightly closed before all water leaves trap—always a perfect water seal. No dribbling, no air loss. Snap-closing prevents fine grit from holding the valve away from the seat.

Trouble-free construction: the flat-strip spring of special Swedish steel lasts for years . . . valve and seat are hardened chrome steel. Cast semi-steel body for pressures to 250 lbs., forged steel for pressures to 1000 lbs.

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Bulletin 2024 tells how to select the right air trap for any job. Gives complete information on all Armstrong air traps for every service. To get your copy, just call your local Armstrong Representative, or write:

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9122 Maple St., Three Rivers, Michigan

ARMSTRONG MACHINE WORKS

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OOR (Double O R)

RIDGID

number for drop-head pipe dies unequaled for easy work, good threads and extra long service!

Larger RIDGID Drop-Head Dies offer same easy work features. 111R, ⅛" to 1¼" 12R, ⅛" to 2"

No wonder pipe "pros" have bought hundreds of thousands of them, the easy way they snap into the ratchet ring handle . . . the smooth clean way they cut ⅛" to 1" threads . . . the quick way the dies reverse for close-to-wall threads. You'll like OOR's, too—get 'em at your Supply House.

The Ridge Tool Company, Elyria, Ohio, U.S.A.

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NEW BOOKS

for the plant engineer

Engineering Aid

ENGINEERING FORMULAS AND TABLES. Size 7⅜ by 5 in.; 396 pp; loose-leaf bound. Published by Lefax, Sheridan Bldg., Ninth and Sansom Sts., Philadelphia 7, Pa. Price with binder $4.75.

A GREAT DEAL of useful information is offered inside a handy loose-leaf binder. Material included in the manual is of the type that, from time to time, is of pressing need for the solution of daily engineering problems, or to settle a point or two. Some of the contents should also be of value for review purposes.

The various sections of the presentation are separted by sheets with tabs which identify subjects treated. Some of the divisions of the manual are as follows: hydraulics; reinforced concrete; electricity and magnetism and mechanics.

Procurement Directory

BEST'S SAFETY MAINTENANCE DIRECTORY. Size 11¼ by 8½ in.; 642 pp including index; illustrated; cloth bound. Published by Alfred M. Best Company, Inc., Best Building, 75 Fulton Street, New York 38, N. Y. Price $7.50.

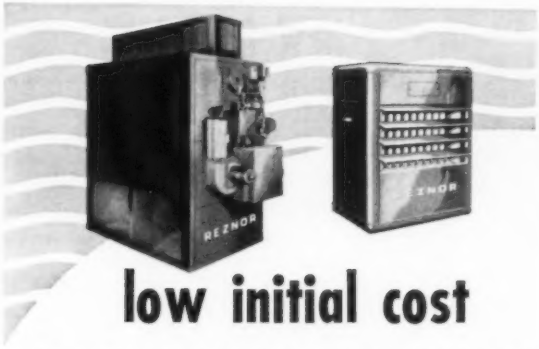
THE SEVENTH bi-annual edition gives descriptions of products including their uses and hazards they overcome. In this book is found material dealing with recognized safety, first aid, sanitation, hygiene and fire production products and equipment. It tells the reader what to use and where to get various items.

Company names and addresses are listed in a handy source index and company listings are especially keyed to indicate manufacturer or distributor. In addition, a complete product and category cross index and a trade name index are included.

Cooling Tower Selection

COUNTERFLOW COOLING TOWER PERFORMANCE. Size 11 x 8¾ in.; 85 pp; paper bound. Published by J. F. Pritchard & Co. of California, Div. of J. F. Pritchard & Co., 4625 Roanoke Parkway, Kansas City, Missouri. Price $3.00.

SELECTION of a counterflow cooling tower can be accomplished with



low initial cost

You get more heating capacity per equipment dollar with Reznor gas unit heaters because the heaters alone are all you need. Reznor heat is on-the-spot heat. You don't have the expense of piping or ducts to carry the heat from a remote heat source. That means savings on materials, and on installation too.

LOW INITIAL COST is just one of many reasons why Reznor gas unit heaters are right for so many plant heating jobs. These completely automatic packaged units also offer substantial savings on installation, operation and maintenance costs. Whether you need one unit to eliminate a "trouble" spot or enough units for a complete plant heating system, ask your Reznor distributor for details or write for your free copy of "Modern Heating".

Look for Reznor under "Heaters-Unit" in the Yellow Pages

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WORLD'S LARGEST-SELLING DIRECT-FIRED
UNIT HEATERS

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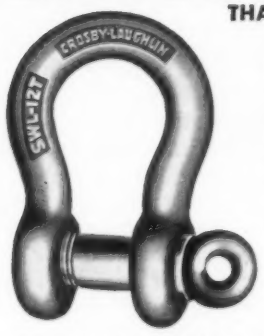

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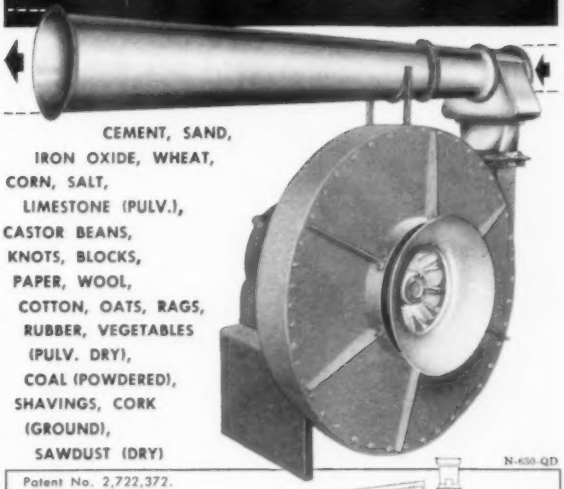

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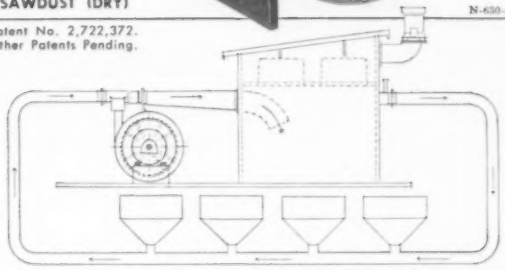

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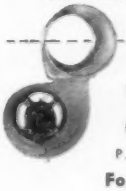

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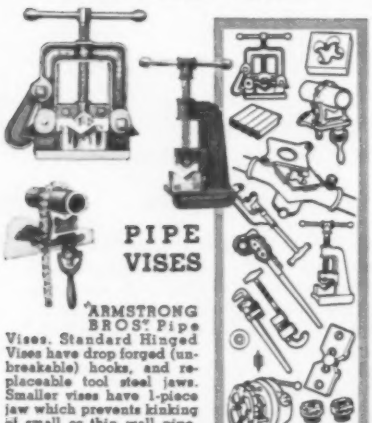

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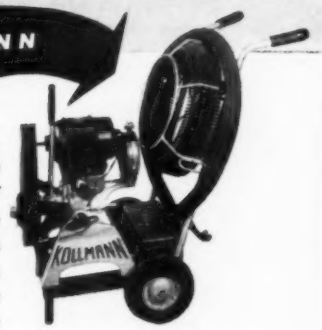

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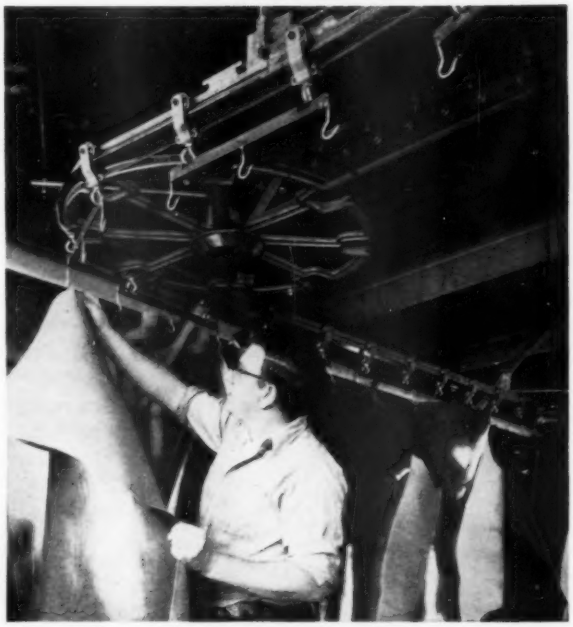

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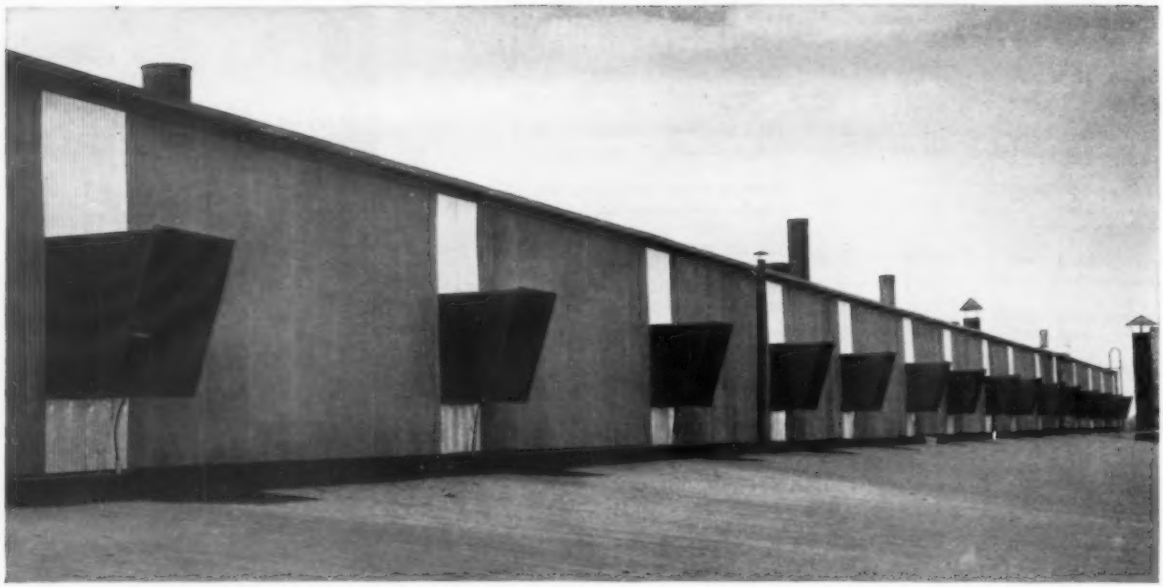

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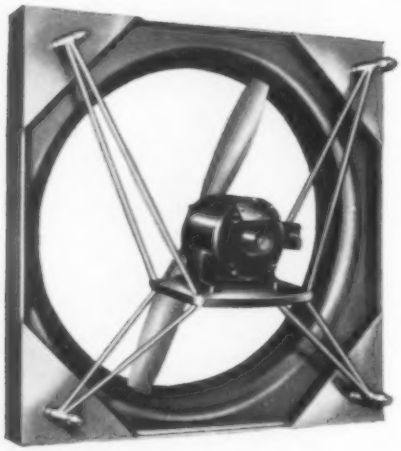

Hartzell square steel panel mountings mean real savings on installation costs for many applications. Any standard or Lo-Noise Hartzell propeller in 24", 28", 32", 36", 44" or 48" diameters is available in this type of construction.

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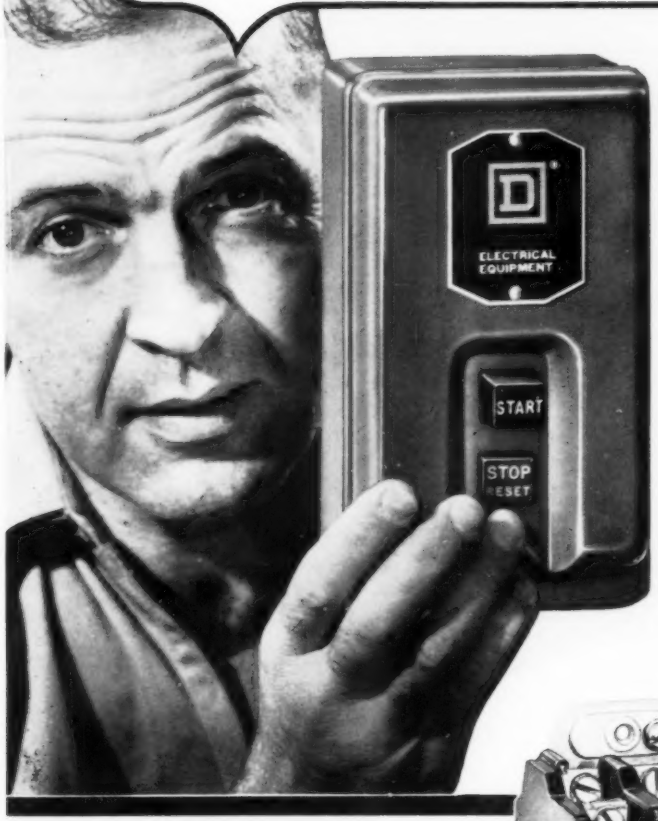


NEMA Sizes 0 and 1

Two, three and four-pole construction

SMALLER! Takes less space, whether it's built into machine or mounted externally

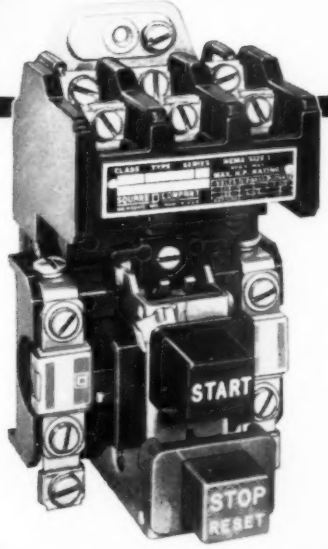
SMART STYLING! Matches the streamlined appearance of today's modern machines

QWIK-MAKE, QWIK-BREAK! Positive snap-action opening and closing of contacts. Longer contact life

TRIP-FREE OVERLOAD PROTECTION! Impossible for operator to hold motor circuit closed against overload

LONGER LIFE! *Toggle Action* operating mechanism. Heavy-duty construction throughout

EASIER INSTALLATION! Wire it without removing starter from enclosure. All terminals have pressure wire connectors



EASIER MAINTENANCE!
"Off-the-Shelf" parts kits make normal maintenance and modifications easier than ever. They're easy to buy, easy to identify, and faster to install

TAMPER-PROOF!
Cover padlocking device prevents tampering by unauthorized personnel. Safety latch locks "start" button in "OFF" position

VISIBLE INDICATION OF OVERLOAD!
Self-centering push-buttons show when overload has occurred

CHOICE OF ENCLOSURES:

Water and Dust-Tight
Hazardous Locations
Flush Mounting

Write **for BULLETIN 2510 B-C**
Address Square D Company,
4041 North Richards Street,
Milwaukee 12,
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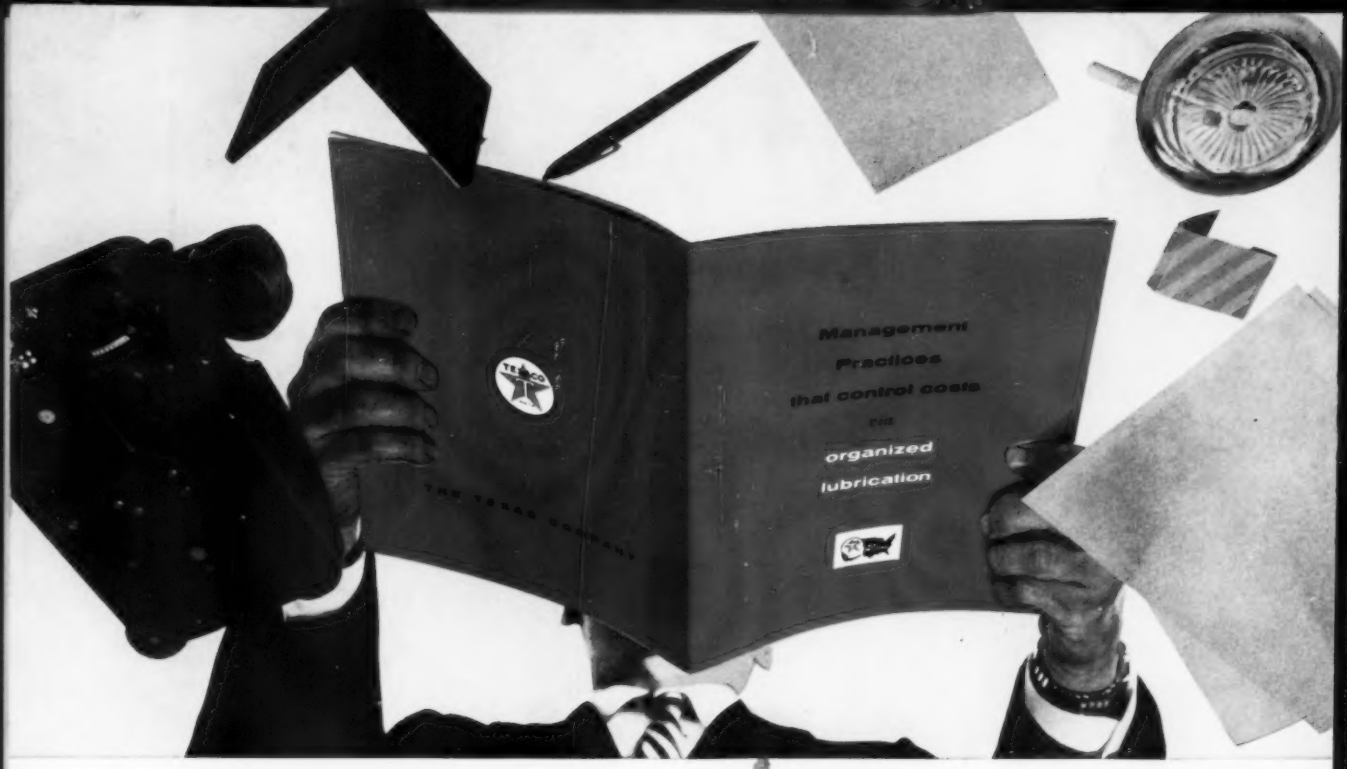

How just 10 minutes with this guide can open the door to major savings

THE Texas Company has developed an important guide to significant savings in a neglected field of cost-control. It's not a book about lubricants—or about lubrication either. After all, lubricants and lubrication are matters that you, as an executive, normally leave to others. Nevertheless, the savings that can be made by good lubrication practices can only be realized when management knows how to organize the lubrication responsibility, what kind of savings to expect, and how to determine them—facts that you can find in Texaco's new guide.

Why this knowledge is a "must" today

Generally lower profit margins plus today's trend toward decentralization have put increased emphasis on the profit-and-loss statement as a measure of management efficiency for each plant unit. This guide uncovers a whole new area for savings for cost-conscious management by showing how to make significant reductions in maintenance costs.

Reducing maintenance costs increases profits *directly*

No other area of plant operation offers management such a major opportunity for savings. For example: A 10% reduction in maintenance costs through better lubrication methods will increase profits up to 4% in the average plant—that's more than equivalent to a 4% increase in sales! *And Texaco's new guide shows how it's done.*

Why organized lubrication is now a major tool for effecting savings

Steadily increasing mechanization has placed a greater premium on continuous high output—and a higher penalty on downtime. Texaco's new guide points out how an organized lubrication plan can bring you substantial savings the following ways:

Here's what an organized lubrication plan does:

• **Raises production** by cutting out inefficient manhours. Texaco's guide shows how one metalworking manufacturer saved 315 manhours per month.

• **Extends parts life** by handing lubrication responsibility to a qualified engineer. One major corporation has already acted on recommendations contained in the guide; expects to effect substantial maintenance savings.

• **Cuts downtime** by insuring that each machine is properly lubricated with the correct lubricant to assure optimum performance. Texaco guide demonstrates how one mill increased bearing life from 16 to 72 shifts.

THIS TEXACO GUIDE TO MANAGEMENT PRACTICE MAY HELP YOUR CORPORATION ACHIEVE SIMILAR RESULTS

Limited quantity available; please attach coupon to your company letterhead

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Please send me Management Practices that Control Costs via Organized Lubrication.

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AUGUST, 1958

Plant Engineering

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The magazine that helps plant engineers with their everyday problems

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